Medical Care Provided to California's Injured Workers

Monitoring System Performance Using Administrative Data

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Preface

Following reforms in 2003–2004 to the California workers' compensation (WC) program, expenditures for medical care provided to injured workers declined for several years, only to begin rising again in 2007. By 2012, total medical spending had increased 32 percent relative to 2007 levels despite a reduction in the number of WC claims. Senate Bill (SB) 863 made additional reforms intended to improve the efficient delivery of high-quality care to injured workers. The Commission on Health and Safety and Workers' Compensation (CHSWC) asked RAND to identify the factors that explain the spending increases and to explore the feasibility of using medical data from the Workers' Compensation Information System (WCIS) for ongoing monitoring of system performance and in-depth analyses of selected issues affecting system performance. This report provides a framework for understanding changes in medical spending levels and provides the results from our analysis of WCIS data for 2007–2012. It establishes a baseline that can be used in a future study to evaluate the impact of the SB 863 provisions. The report should be of general interest to stakeholders in California's WC system and in other WC programs.

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RAND Justice Policy

The research reported here was conducted in the RAND Justice Policy Program, which spans both criminal and civil justice system issues with such topics as public safety, effective policing, police–community relations, drug policy and enforcement, corrections policy, use of technology in law enforcement, tort reform, catastrophe and mass-injury compensation, court resourcing, and insurance regulation. Program research is supported by government agencies, foundations, and the private sector.

This program is part of RAND Justice, Infrastructure, and Environment, a division of the RAND Corporation dedicated to improving policy- and decisionmaking in a wide range of policy domains, including civil and criminal justice, infrastructure protection and homeland security, transportation and energy policy, and environmental and natural resource policy.

This report also drew on the expertise in RAND Health, one of the most trusted sources of objective health policy research in the world.

Questions or comments about this report should be sent to the project leader, Barbara Wynn (Barbara_Wynn@rand.org). For more information on RAND research on workers' compensation, see https://www.rand.org/topics/workers-compensation.html.

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Summary

Background

The workers' compensation (WC) program provides medical care and indemnity (i.e., wage replacement) benefits to employees with work-related injuries and illnesses. In 2014, an estimated 17 million workers in California were covered by the state's WC program, and 534,000 claims were filed for workplace-related injuries and benefits, ranging from minor medical treatment cases to catastrophic traumatic brain injuries and spinal cord injuries (Division of Workers' Compensation, 2016b).

From 2007 to 2012, California's spending on WC medical benefits grew from $5.2 billion to $6.8 billion.[1] By 2012, medical spending was 58 percent of total benefit spending compared with 50 percent for WC programs in other states. Average medical spending per covered worker in California ($452) was more than twice the average for all other state WC programs ($209) (Sengupta, Baldwin, and Reno, 2014). Increased medical spending and higher average spending per claim led to provisions in Senate Bill (SB) 863 intended to improve the efficient delivery of high-quality medical care to injured workers. The data available for this study predate the implementation of the SB 863 provisions beginning in 2013. RAND is performing a separate evaluation of the impact of the SB 863 medical treatment provisions that will draw on post–SB 863 data. We anticipate that the analyses in this report will inform the methods and approach that we use to evaluate the SB 863 provisions.

Study Approach

This study builds on an earlier RAND study that examined the impact of the 2003–2004 reforms on medical care provided under California's WC system (Wynn, Timbie, and Sorbero, 2011). The current study draws primarily on the Workers' Compensation Information System (WCIS) to examine medical treatment provided in 2007 (the first year in which medical data were collected) through 2012. The study has three objectives:

1. Decompose annual medical spending trends to identify the factors that explain the spending increases from 2007 to 2012. In these analyses, we estimate the impact of changes in the number of WC claims, injury mix, and price inflation on annual medical spending. We attribute the difference between the estimated changes attributable to these

[1] RAND estimates are based on Workers' Compensation Insurance Rating Bureau (WCIRB) annual reports on California WC losses and expenses and three-year moving average of insured market share calculated from first report of injury (FROI) claim counts downloaded from the WCIS website as of January 11, 2017.

factors and the actual changes in spending levels to changes in the volume and mix of medical services provided to injured workers.
2. Explore the feasibility of using the WCIS medical data for ongoing monitoring of system performance.[2] In these analyses, we examine trends in medical utilization and spending, access to care, quality, and return to work by type of service and by selected claim characteristics such as payer status, geographic region, and type of injury.
3. Expand on the monitoring analyses by conducting in-depth analyses of selected issues affecting system performance. We develop additional measures related to physician participation in the WC medical care system that provide a potential baseline for assessing the impact of implementing a new physician fee schedule under SB 863 and monitoring access to care. We also explore the trends in medical-legal expenses.

Highlights from Specific Analyses

Decomposing Spending Trends

The purpose of this analysis was to use the WCIS to examine several potential drivers of medical spending growth, that is, changes in number of WC claims, injury mix, and medical price inflation from 2007 through 2012. Our primary goal was to decompose changes in medical spending across these observable drivers. We attribute any residual, unexplained change to more elusive drivers such as changes in the volume and mix of services, practice patterns, new technology, and unmeasured changes in injury mix. The distinction between observable and unobservable drivers of medical expenditures is of importance to policymakers for two reasons. First, the impetus to reform WC in response to medical spending growth may differ if a major portion of growth is easily explained or even anticipated. Second, optimal reform tools will vary depending on the source of growth.

Spending for medical services increased 9.9 percent over 2008–2012 compared with fee schedule inflation of 8.8 percent (Table S.1). However, we estimate that the decline in the number of new WC claims during 2008–2011 more than offset the expected increase in spending attributable to inflation. Changes in injury mix had minimal impact on expected medical spending. After accounting for the measured cost drivers in our framework (inflation, claims incidence, and injury mix), the expected increase in 2012 spending for medical services was –2.4 percent. The difference between the actual increase in medical service spending (9.9 percent) and the expected increase (–2.4 percent) produces a residual increase of 12.3 percent attributable to unmeasured changes in intensity of services and injury mix.

Aggregate medical spending increased 29.4 percent over 2007–2012 (Table S.1). A major driver in the spending growth was payments to individuals, which increased 139.2 percent. This expense category includes future medical expense settlement amounts, transportation costs, and

[2] The Division of Workers' Compensation (DWC) estimates that 91–92 percent of claims are reported in the WCIS, but that medical data are submitted for 86 percent of the reported claims.

payments for services that are not reported and billed by medical providers, such as payments to home care attendants hired by the injured worker. In comparison, the Consumer Price Index (CPI) for medical services increased 18.2 percent over the same period. Because these expenses are typically not captured in the WCIS medical data, other data sources will be needed to better understand the composition of these expenses and the extent to which the spending growth represents actual changes in spending levels or improvements in how the portion of lump-sum settlements attributable to future medical expenses is reported. In the interim, caution should be used in interpreting trends in total medical spending.

Table S.1. Actual, Expected, and Residual Changes in Total Medical Spending by Service Year Relative to 2007 Systemwide Spending

	2007 Spending ($million)	Percentage Change in Spending Relative to 2007				
		2008	2009	2010	2011	2012
Spending for Medical Services						
a. Actual spending	4,419	6.4	2.6	7.9	5.5	9.9
b. Expected change		0.0	–0.3	–1.3	–2.4	–2.4
c. Residual change		6.4	3.0	9.2	7.9	12.3
Payments to Individuals						
a. Actual spending	826	20.5	51.0	51.2	102.4	139.2
b. Expected change		3.7	7.0	10.6	14.0	18.2
c. Residual change		16.8	44.0	40.6	88.4	121.0
Total Medical Spending						
a. Actual spending	5,245	8.6	10.2	14.7	20.8	30.2
b. Expected change		0.6	0.8	0.6	0.2	0.9
c. Residual change		8.0	9.4	14.1	20.6	29.4

SOURCE: RAND estimates derived from multiple data sources.

The residual captures changes in the volume and mix of medical services, changing practice patterns and new technology, and unmeasured case mix. The residual for 2012 spending for medical services is $541 million, or 11 percent of spending for medical services. The size highlights the need to examine changes in volume and mix of services. In the next section, we discuss per-claim trends in utilization and spending for medical services.

The estimated 2012 residual for total medical spending is $1.54 billion. However, increases in payments to individuals account for 65 percent of the residual for total 2012 medical spending and may not represent real increases in spending.

Utilization and Spending Trends for Medical Services

WCIS per-claim spending for injury year 2012 was 24 percent higher than for injury year 2007, or more than twice the increase explained by price inflation. Per-claim utilization and spending patterns are similar for most services other than hospital services, laboratory/pathology services, and drugs in the first 12 months following injury. Key findings by type of service include the following:

- Per-claim spending within 12 months of injury on both inpatient hospital stays and outpatient (hospital and ambulatory surgery center [ASC]) facility services increased significantly for 2007–2010 injuries but decreased for 2011 and 2012 injuries. The net increase in per-claim spending for 2007–2012 injuries was 17 percent and 18 percent for inpatient and outpatient facility services, respectively.
- Utilization and spending for laboratory and pathology services increased dramatically over the 2007–2012 period. While there were increases across all types of tests, major increases were seen in the drug testing codes.
- The number of prescription drugs per user peaked in injury year 2010 but spending continued to increase. Spending per user on prescription drugs in injury year 2012 was 38 percent higher than for injury year 2007.

There are significant differences in both utilization and spending across geographic regions and type of payer. Per-claim spending within 12 months of injury for 2012 injuries was 29 percent higher than levels for 2007 injuries in Northern California compared with 24 percent higher in Southern California. Per-claim spending within the first 12 months on 2012 injuries increased 35 percent relative to spending on 2007 injuries for self-insured employers (including the State of California) compared with a 21 percent increase for insured employers. The trend comparison between self-insured and insured status may be affected by employer changes in insured/self-insured status.

Return-to-Work Outcomes

We used Employment Development Department (EDD) data to track the proportion of injured workers who were still employed during each of the first eight calendar quarters after injury. Overall return-to-work outcomes for the first eight quarters dipped slightly during the recession but rebounded in 2011, so the outcomes are generally unchanged. For example, 90.4 percent of workers injured in 2007 were employed at Q1 after injury compared with 88.6 percent of workers injured in 2010 at the height of the financial crisis and 89.4 percent of workers injured in 2012 after the start of the recovery. Across all injuries occurring in 2011, 74.5 percent of workers were at work after eight quarters compared with 71.2 percent after

eight quarters for injury year 2007.[3] Workers in Northern California were slightly more likely to be employed at all quarters after injuries than workers in Southern California.

Quality Indicators

We chose evidence-based quality indicators that can be measured through billing data for four types of injuries: low back pain and injuries to the knee, shoulder, and upper back/neck. The indicators are consistent with the medical treatment utilization schedule used to define medically appropriate care under California's WC program. For example, the medical treatment guidelines do not recommend use of imaging within the first 28 days unless there are red flags or imaging is otherwise needed for medical management. With the exception of uncomplicated low back pain, we found that the measures were fairly stable from 2007 to 2012. The percentage of uncomplicated low back pain injuries that received one or more imaging studies within the first 28 days was high in 2007 (42.7 percent) compared with the percentage of upper back injuries, and increased to 47.7 percent in 2012. Another set of measures examined continuous use of opioids for 14 days or more during the first 12 months postinjury. Across each of the four injury categories, the percentage of injuries with at least 14 days of continuous opioid use was higher in 2012 than in 2007 despite the implementation of chronic care treatment guidelines in 2009. For example, the percentage of low back pain injuries with at least 14 days of continuous opioid use increased from 14.8 percent in 2007 to 16.0 percent in 2012.

Access to Care

We designed our access indicators to track trends in care provided to injured workers during the first 12 months following the date of injury. One access to care measure focused on trends in the timeliness of nonemergent care. We found that the median time from an injury to an initial evaluation and management (E&M) visit was two days from 2007 through 2011 and three days in 2012.

A second measure was the number of primary care providers (PCPs) involved in providing care. Our underlying assumption is that most workers who are satisfied with their PCP will remain with that provider. If an injured worker sees multiple PCPs within the first 12 months, it could be indicative of worker dissatisfaction with care or difficulty seeing a preferred provider. However, it could also be indicative of complex care issues requiring specialized care that the initial provider is less equipped to provide. Across all injuries and the four types of injuries, we found a modest upward trend in both the proportion of injured workers seeing multiple PCPs within 12 months of injury and the average number of PCPs that they see.

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[3] The year-to-year changes in the proportion of injured workers who are employed are more important than the actual percentage of workers who are employed in a given year. This is because the proportion of workers—injured or otherwise—who remain employed over time decreases due to exits from the labor force. About 10–20 percent of workers would be out of the measured workforce even absent an injury at eight quarters.

Physician Services

We also examined several measures indirectly related to access to physician services by WC patients. These include provider availability as measured by physician participation rates in WC, payment adequacy in comparison with commercial insurance payments for similar services, and potential market power of WC medical provider networks (MPNs) as reflected in fee discounting prior to the implementation of a new resource-based relative value scale (RBRVS) fee schedule.

Provider Participation Rates for WC Patients

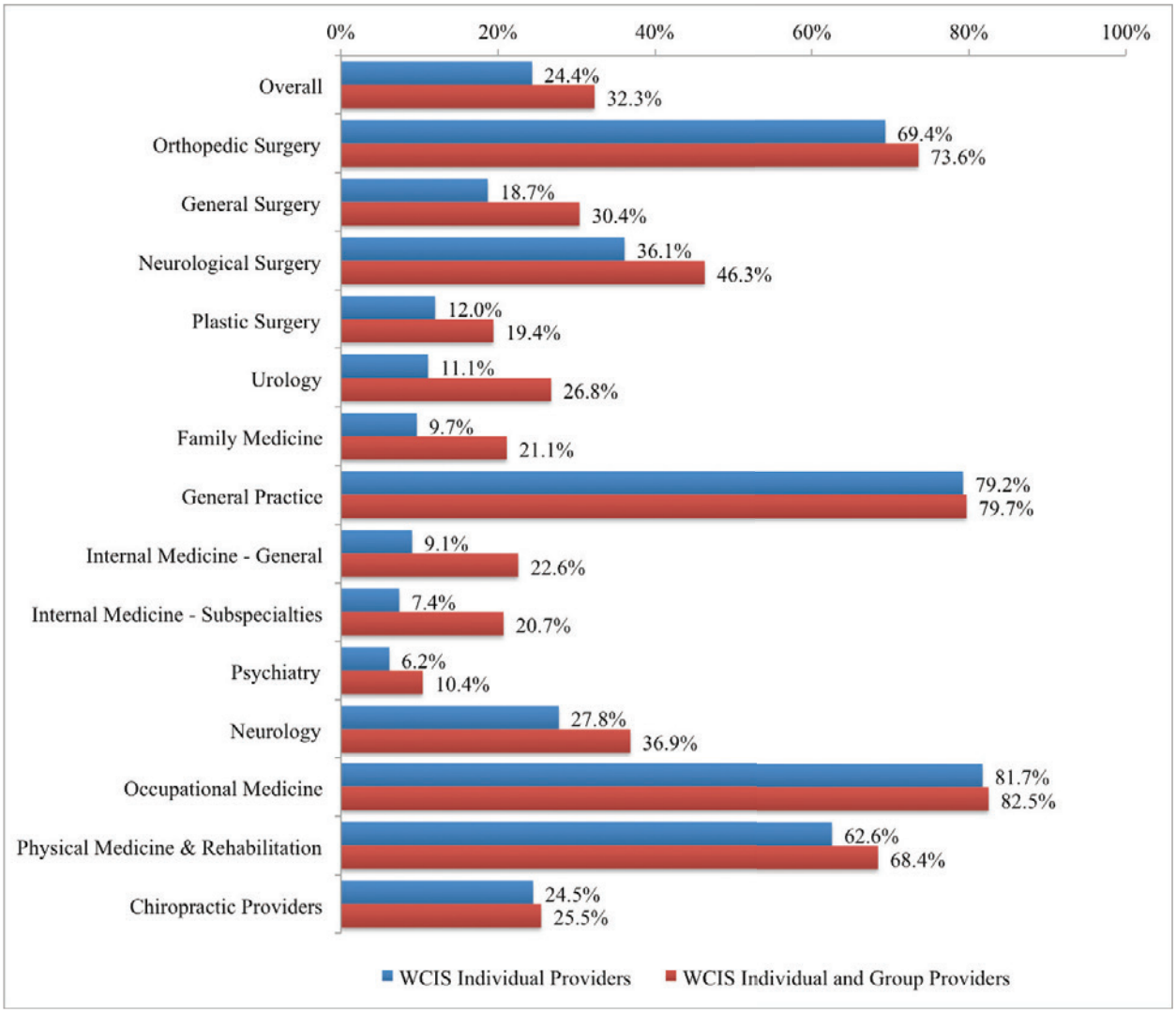
Our objective in this analysis was to assess by specialty the proportion of physicians involved in patient care who serve WC patients. After reviewing alternative data sources, we calculated physician participation rates using the National Provider National Plan & Provider Enumeration System (NPPES) data to define the universe of active providers likely to serve WC patients and the primary specialty reported in the WCIS. We found that some bills for physician services report the individual physician furnishing the service using an individual National Provider Identifier (NPI), while other bills report only a group NPI physician. When the group NPI is reported, we are unable to identify which physicians within the practice treat WC patients. Based on individual reported NPIs, about one-quarter of physicians participated in WC in 2012 (Figure S.1). If we include all the members of a group that billed using the group NPI rather than individual NPIs, the overall participation rate increases to 32.3. Using either measure, participation rates vary significantly across specialties, an expected result given the nature of the services required for work-related injuries.

Comparison of Commercial Insurance Payments with Official Medical Fee Schedule Payments Under RBRVS

The purpose of this analysis was to determine average payment levels by commercial insurance plans for network care and to compare them with what is paid under the new RBRVS fee schedule. The comparison is one measure of current payment adequacy for WC services. Overall, RBRVS payments were about 11.8 percent higher than commercial insurance payments,[4] but there was also large variation in the payment ratios across types of services. Commercial insurance payments for E&M, surgery, and chiropractic services were largely in line with RBRVS-based payments. Commercial payments for radiologic services were nearly 40 percent higher than RBRVS payments, whereas payments for pathology and manipulative treatment services were 20 percent less. Commercial insurance paid only about half of what the RBRVS pays for physical therapy.

[4] The RBRVS, which is based on 120 percent of Medicare, was transitioned over a four-year period. For this analysis, we compared what the fully transitioned allowances would have been in 2012 with the commercial payment rates.

Figure S.1. Physician Participation Rates Using NPPES Data to Define Universe of Active Physicians



Pre-RBRVS Discounting for Physician Services

The purpose of this analysis was to measure the average discount off the Official Medical Fee Schedule (OMFS) allowed amount by computing the proportion of the allowed amount that was actually paid prior to implementation of the RBRVS. For this analysis we focused on outpatient nonfacility physician services only. Our estimates are for overall discount rates because data limitations precluded us from calculating a discount rate specific to services furnished by physicians participating in an MPN. We found that prior to implementation of the RBRVS, actual payments on average were about 89 percent of allowed amounts. Discounts for surgery and manipulative treatments were slightly larger—14 percent and 18 percent, respectively.

Medical-Legal Expenses

Medical-legal expenses are incurred when a medical expert evaluates an injured worker's condition to determine entitlement to WC benefits but does not provide medical treatment. In decomposing the cost drivers for medical spending, we found that payments for medical-legal expenses increased 46 percent from 2007 to 2012 despite no fee schedule increases. We found the increases were largely attributable to an increase in the number of evaluations (particularly follow-up evaluations), the proportion of evaluations that are paid based on an hourly rate rather than a flat rate, and the average number of units billed per evaluation. On a per-claim basis, the number of evaluations has also been increasing. At DWC's request, we will review the fee schedule of medical-legal services in a forthcoming report.

Overall Findings and Limitations Regarding WCIS Analyses

One study objective was to explore the feasibility of using the WCIS medical data for ongoing monitoring of system performance. The WCIS is the logical data source to use in ongoing monitoring since DWC maintains the WCIS and the system includes systemwide transaction-level medical data from insurers and self-insured employers that are continually updated. In general, we found that the WCIS can be used both to monitor overall trends in spending and utilization of medical services provided to injured workers and to examine specific issues. However, there are limitations to using these data because not all WC claims are reported into the system, and among the reported claims, there is further underreporting of medical bills. We addressed the underreporting by examining spending and utilization on a per-claim basis or as a percentage of total spending. Until there is greater compliance with reporting requirements, estimates of total spending and utilization cannot be generated from the WCIS data without supplementing the WCIS with external data.

Other limitations in the WCIS constrained the issues that we were able to examine. The relative newness of the data meant that our trend analyses were restricted to 24 months following date of injury. Trends for additional years following date of injury will be feasible in the future. Two important data elements that have not been collected in the past—the NPI for the provider furnishing each service and an identifier for each MPN—became mandatory with the implementation of WCIS version 2.0 for medical data effective April 6, 2016. Assuming that the new reporting requirements are enforced, the ability to compare medical services across MPNs and to determine which California providers are furnishing services to injured workers will be greatly enhanced.

Recommendations for Monitoring System Performance

As discussed in an earlier study (Wynn, Timbie, and Sorbero, 2011), a performance monitoring system should be designed to provide information that will enable policymakers and other stakeholders to identify areas in which performance is suboptimal. This allows for the

prioritization of identified issues and the development of policies and interventions that will facilitate improvements in performance. These same systems can then be used to evaluate the effects of reforms and interventions.

For this report, we focused on a broad set of measures that can be derived from administrative data and used on an ongoing basis to monitor trends in WC medical care and identify potential issues that merit further analysis. The timing of this report is such that the trends predate the major reforms enacted in SB 863. Therefore, our results are generally more appropriately used as a baseline for evaluation of the SB 863 provisions than as a springboard for identifying potential issues that merit additional policy changes. A discussion of potential policy changes is more appropriately deferred until the SB 863 provisions are evaluated.

Our results confirm the representativeness of the WCIS data but also highlight data limitations. DWC has incorporated additional data elements into the WCIS medical data reporting requirements that should address some important limitations in using the WCIS to monitor system performance. However, ongoing system monitoring relies on having complete and reliable WCIS data. Heretofore, DWC has focused its efforts on encouraging voluntary compliance rather than enforcement. These efforts have not been sufficient to yield complete reporting, and enforcement actions are indicated to improve compliance. Senate Bill 826 (2016) added administrative penalties to Labor Code section 138.6 for failing to comply with WCIS data reporting requirements in 2011. Regulations were proposed in 2013 to implement the financial penalties but were not finalized. Now that substantial clarifications and improvements have been made to the reporting requirements, consideration should be given to implementing the financial penalties.

Acknowledgments

Throughout this study, our research team benefited from ongoing support from individuals in the Department of Industrial Relations. We are particularly grateful for the overall guidance and continuing support provided by Christine Baker, Director, Department of Industrial Relations, and by Irina Nemirovsky in her role as the contracting officer's representative. We would also like to acknowledge the valuable assistance received from current Division of Workers' Compensation staff, including George Parisotto, Genet Daba, John Gordon, and David Henderson, and from former DWC staff members Destie Overpeck and Rupali Das. We also benefited from the support provided by Eduardo Enz and Nabeela Khan, Commission on Health and Safety and Workers' Compensation staff. We appreciate the expert input provided by various stakeholders in the WC system throughout the study. Additionally, we thank Frank Neuhauser, University of California at Berkeley, and Melony Sorbero, RAND, for their careful review and thoughtful comments on an earlier version of this report.

Abbreviations

ACOEM	American College of Occupational and Environmental Medicine
AD	Administrative Director of the Division of Workers' Compensation
AMA	American Medical Association
AME	agreed medical examiner
ARF	Area Resource File
ASC	ambulatory surgery center
BETOS	Berenson-Eggers Type of Service
CHSWC	Commission on Health and Safety and Workers' Compensation
CMS	Centers for Medicare and Medicaid Services
CPI	Consumer Price Index All-Urban Consumers
CPI-MC	Consumer Price Index-All-Urban Consumers-Medical Care
CPT®	Current Procedural Terminology
CT	computed tomography
DF	discounting factor
DO	Doctor of Osteopathic Medicine
DWC	Division of Workers' Compensation
E&M	evaluation and management
ED	emergency department
EDD	Employment Development Department
FROI	First Report of Injury
HCPCS	Healthcare Common Procedure Coding System
HRR	hospital referral region
ICD-9-CM	International Classification of Diseases, Clinical Modification
JCN	jurisdiction claim number
LE	lower extremity
MBC	Medical Board of California
MD	Doctor of Medicine (allopathic)
MEI	Medicare Economic Index
MPFS	Medicare physician fee schedule
MPN	medical provider network
MRI	magnetic resonance imaging
MTUS	Medical Treatment Utilization Schedule
NASI	National Academy of Social Insurance
NCQA	National Committee for Quality Assurance
NDC	National Drug Code

NPI	National Provider Identifier
NPPES	National Provider National Plan & Provider Enumeration System
OMFS	Official Medical Fee Schedule
OPPS	outpatient prospective payment system
PCP	primary care provider
PENS	percutaneous electrical nerve stimulation
PTP	primary treating physician
QME	qualified medical examiner
RBRVS	resource-based relative value scale
RVU	relative value unit
SB	Senate Bill
SOII	Survey of Industrial Illness and Injuries
SROI	Subsequent Reports of Injury
TC	technical component
TENS	transcutaneous electrical nerve stimulation
UE	upper extremity
WC	workers' compensation
WCIRB	Workers' Compensation Insurance Rating Bureau
WCIS	Workers' Compensation Information System

1. Introduction

California WC Medical Spending in Perspective

Workers' compensation (WC) provides medical care and indemnity (i.e., wage replacement) benefits to employees with work-related injuries and illness. It is a mandatory "no-fault" system in which benefits are paid by the employer without the need to determine whether employer or employee negligence caused the injury. In 2014, an estimated 17 million workers in California were covered by WC, and 534,000 claims were filed for workplace-related injuries and benefits, ranging from minor medical treatment cases to catastrophic traumatic brain injuries and spinal cord injuries (DWC, 2016b). Employers provide WC coverage through several mechanisms, including purchasing WC insurance from commercial insurance companies or from the California State Compensation Insurance Fund (a public nonprofit carrier) or by setting up a self-insured employer fund. The Division of Workers' Compensation (DWC) within the Department of Industrial Relations is responsible for the administration of the program.

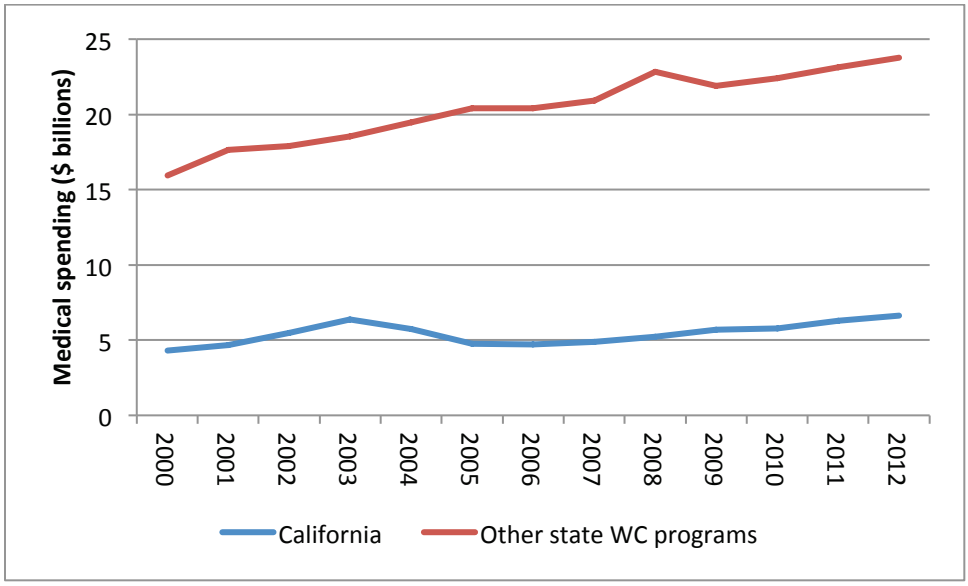
Growth in medical spending is a major concern to employers that are obligated to carry WC insurance or self-insure against workplace injuries. Private insurance companies writing WC policies integrate anticipated medical spending changes into their premiums but are at risk for unanticipated changes in WC medical spending. Higher WC premiums driven by medical spending growth may ultimately impact employees through lower wages or reductions in other benefits and through lower employment (Gruber and Krueger, 1991).[1]

Over 2000–2012, California's nominal spending on medical benefits under its WC programs grew from $4.3 billion to $6.8 billion and accounted for 19–26 percent of total U.S. spending for medical benefits in nonfederal WC programs (Figure 1.1).[2] In 2012, California medical spending was 58 percent of total benefit spending compared with 50 percent across WC programs in other states (Sengupta, Baldwin, and Reno, 2014).

[1] Viscusi and Moore (1987) report a 1 dollar increase in WC benefits reduces wages by 12 cents. Gruber and Krueger (1991) found that while a sizable portion of the cost of WC benefits is shifted to employees in the form of lower wages; employers also bear at least some additional cost. Each 1-percentage-point increase in WC rates is associated with an employment decline of 0.11 percent.

[2] Nominal growth is the observed growth in spending. Real growth is determined by adjusting the observed growth for changes in the prices of medical services.

Figure 1.1. WC Medical Spending for Nonfederal Employees, California and Other State WC Programs, 2000–2012



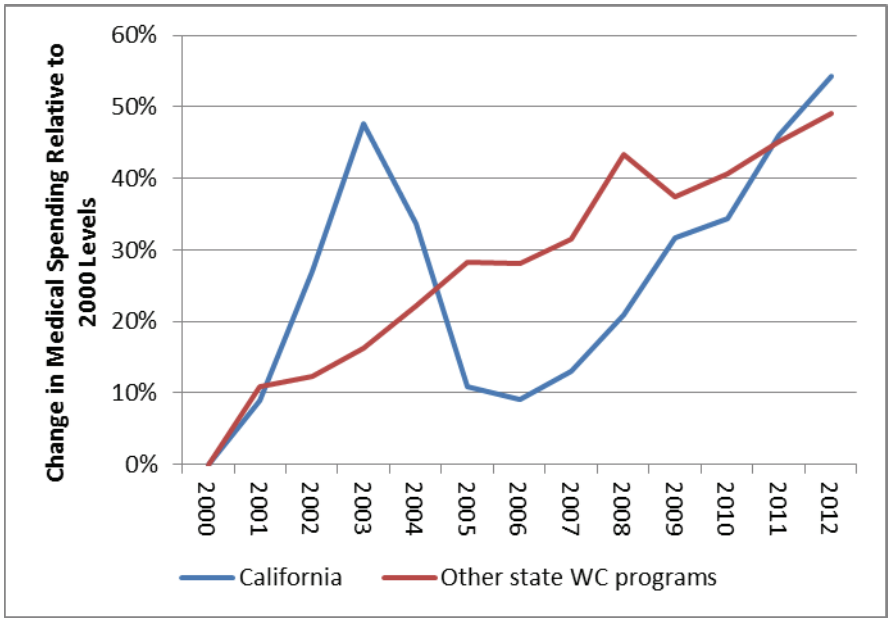
SOURCES: Williams, Reno, and Burton, 2004; Sengupta, Reno, and Burton, 2007; Sengupta, Reno, and Burton, 2008; Sengupta, Reno, and Burton, 2009; Sengupta, Reno, and Burton, 2010; Sengupta, Baldwin, and Reno, 2014; Baldwin and McLaren, 2016.

The medical spending experience in California is characterized by three periods: (1) steep medical spending increases in the early 2000s, (2) steep declines in medical spending attributed to reforms implemented in 2003–2004 that were motivated in large part by medical spending growth, and (3) a return to medical spending growth beginning in 2008. Figure 1.2 shows the percent change in medical spending between 2000 and 2012 for California and other state WC programs using data reported by the National Academy of Social Insurance (NASI). Figure 1.3 compares WC medical spending per covered worker (state WC medical spending divided by the number of workers covered by WC insurance) as reported by NASI.[3]

Both figures clearly illustrate the decline in California WC medical spending following the 2003–2004 reforms and the increase in subsequent years. By 2012, total medical spending was 54 percent higher than 2000 levels; in comparison, total medical spending in 2012 in the remaining states was 49 percent higher than 2000 levels. Figure 1.3 shows that despite the 2004 reforms,

[3] NASI publishes an annual report detailing WC costs and benefits. Because there have been periodic refinements in the methodology used to compile the state data, we use the most recent published information about medical benefit spending in a given year. For example, prior to the 2008 report (Sengupta, Reno, and Burton, 2010), California medical spending data included medical cost containment expenses. When NASI excluded the California medical cost containment expenses in 2008, it also reestimated California medical spending excluding medical cost containment expenses in earlier years and included information for 2004–2007 in the 2008 report. We obtained comparable information for 2001–2003 from NASI so that our trend line is exclusive of medical cost containment expenses. Spending for medical cost containment activities rose sharply in California from 2000 to 2009 (CHSWC, 2011).

Figure 1.2. Cumulative Increase in WC Medical Spending for Nonfederal Employees, California and Other State WC Programs, 2000–2012



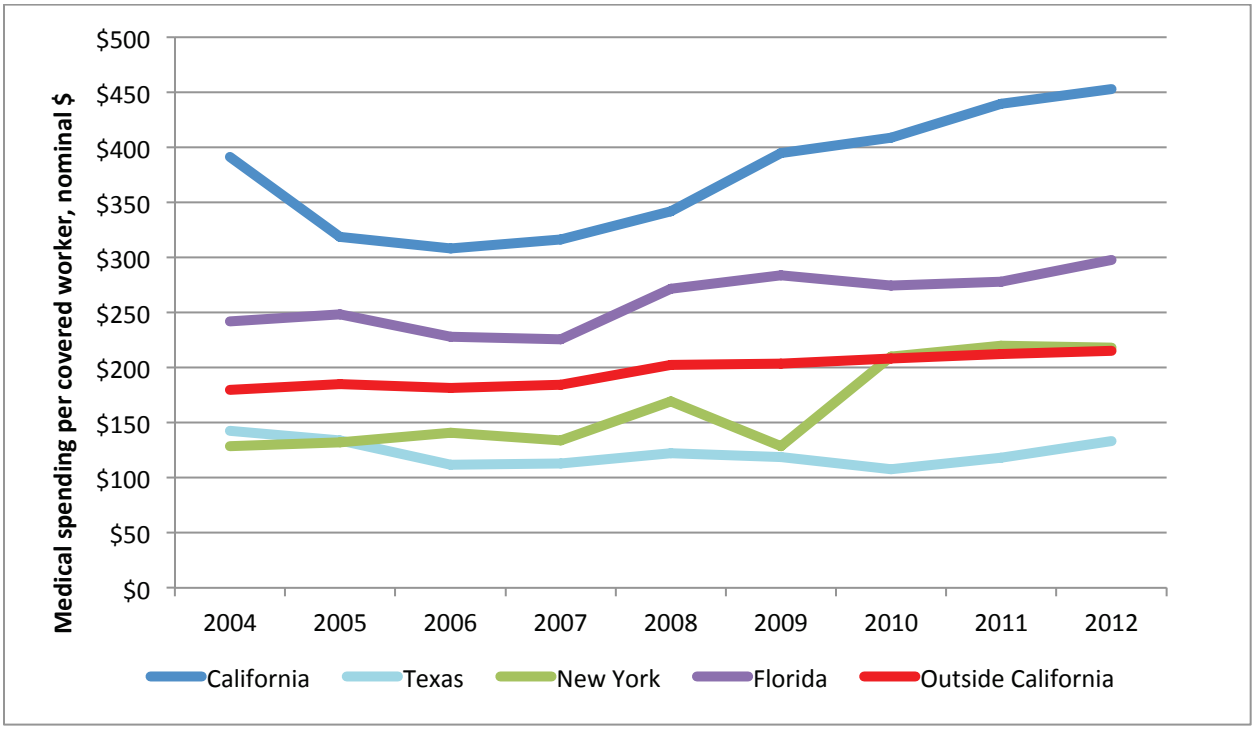
SOURCES: Williams, Reno, and Burton, 2004; Sengupta, Reno, and Burton, 2007; Sengupta, Reno, and Burton, 2008; Sengupta, Reno, and Burton, 2009; Sengupta, Reno, and Burton, 2010; Sengupta, Baldwin, and Reno, 2014; Baldwin and McLaren, 2016.

California continues to have higher WC medical spending per employee than WC programs in other states. In recent years, California WC medical spending per employee was more than three times that of Texas and twice as high as the average for all other state WC programs.

Increased medical spending and higher average spending per claim led to provisions in Senate Bill (SB) 863 intended to improve the efficient delivery of high-quality medical care to injured workers.[4] The data available for this study predate the implementation of the SB 863 provisions beginning in 2013. RAND is performing a separate evaluation of the impact of the SB 863 medical treatment provisions that will draw on post–SB 863 data. We anticipate that the analyses in this report will inform the methods and approach that we use to evaluate the SB 863 provisions.

[4] Key provisions affecting medical care included implementation of an independent medical review process to resolve medical necessity disputes, an independent bill review process to resolve fee schedule issues, and a new physician fee schedule based on 120 percent of the amounts payable under Medicare's resource-based relative value fee schedule. Other fee schedule changes included establishment of fee schedules for home health services, interpreter services and copy services, and elimination of a pass-through payment for spinal hardware implanted during inpatient spinal surgeries.

Figure 1.3. Average Medical Spending per Covered Worker—California, Other Large WC Programs, and All State Programs Other Than California, 2004–2012



SOURCES: Sengupta, Reno, and Burton, 2007; Sengupta, Reno, and Burton, 2008; Sengupta, Reno, and Burton, 2009; Sengupta, Reno, and Burton, 2010; Sengupta, Baldwin, and Reno, 2014; Baldwin and McLaren, 2016.

Study Objectives

This study builds on an earlier RAND study that examined the impact of the 2003–2004 reforms on medical care provided under California's WC system (Wynn, Timbie, and Sorbero, 2011). The current study draws primarily on the Workers' Compensation Information System (WCIS) to examine medical treatment provided in 2007 (the first year in which medical data were collected) through 2012. The study has three objectives:

1. Decompose annual medical spending trends to identify the factors that explain the spending increases from 2007 to 2012. In these analyses, we use the WCIS data to estimate the impact of changes in the number of WC claims, injury mix, and price inflation on medical spending. We attribute the difference between the estimated changes in spending levels attributable to these factors and the actual changes in spending levels to changes in the volume and mix of medical services provided to injured workers.
2. Explore the feasibility of using the WCIS medical data for ongoing monitoring of system performance. In these analyses, we examine trends in medical utilization and spending, access to care, quality, and return to work by type of service and by selected claim characteristics such as payer status, geographic region, and type of injury.

3. Expand on the monitoring analyses by conducting in-depth analyses of selected issues affecting system performance. We develop additional measures related to physician participation in the WC medical care system that provide a potential baseline for assessing the impact of implementing a new physician fee schedule under SB 863 and monitoring access to care. We also explore the trends in medical-legal expenses.

Organization of This Report

The remainder of this report is organized as follows.

Chapter Two provides an overview of the WCIS data that we use as our primary data source for the analyses in this report. Supplemental data sources that are used for specific analyses are described in the chapter of the report describing those analyses.

Chapter Three discusses the framework for our decomposition of annual medical spending and provides the results from our estimations of the effects of the different factors affecting spending.

The next three chapters provide an overview of our monitoring analyses and findings with respect to medical spending, utilization, and return-to-work outcomes (Chapter Four); quality of medical care (Chapter Five); and access to care (Chapter Six).

Chapter Seven provides the results from analyses relevant to access to physician services. We investigate the proportion of physicians active in patient care that provides medical services to WC patients. We also measure the average discount that is applicable to physician services, and we compare the prices paid under the Official Medical Fee Schedule (OMFS) in 2012 with those paid by group health plans.

In Chapter Eight, we provide the results from analyses that examine trends in the utilization and spending for medical-legal evaluations that address work-related issues.

Chapter Nine summarizes our findings and discusses next steps in monitoring and evaluating the care provided under California's WC system.

2. Data

The primary data source for our study is the WCIS database maintained by DWC for services provided from 2007 to 2013. The WCIS uses electronic data interchange to collect comprehensive information from claims administrators[1] to help the Department of Industrial Relations oversee the state's WC system. In 2006, the WCIS was expanded to include medical data. Data are transmitted to DWC within 90 calendar days of the bill payment or the date of final determination that payment for billed medical services would be denied. By law, claims administrators handling at least 150 total claims per year are required to report medical data for all services provided on or after September 22, 2006. We have chosen to use the WCIS as our primary data source because it is the most complete and representative dataset available. Each medical bill includes information on the injured worker and provider, diagnosis and procedure codes, the provider's charges, actual payments to providers, and codes explaining the reasons for adjustments between the billed charges and paid amounts.

Even though the WCIS is the best data available, it has limitations. Not all WC claims are reported into the system, and among reported claims there is further underreporting of medical bills.[2] Because the WCIS does not include all claims with medical expenditures, representativeness is a potential issue. If the distribution of services in the available data diverges from the "true" distribution (for all claims), this has implications for our policy analyses. Given the absence of a gold standard dataset to which we can compare the WCIS, we adopted several different approaches to assess the representativeness of the 2011 WCIS medical claims data. First, we compared the distribution of the nature of worker injury based on the FROI[3] with the distribution for the claims with medical data (Table 2.1). If the distributions are similar, this suggests that, at a minimum, the medical claims data are representative of all claims with a FROI.

Second, we compared the distribution of payments by physician specialty in the WCIS with the distribution of payments reported by the Workers' Compensation Insurance Rating Bureau (WCIRB). The WCIRB includes only insurer indemnity claims, while the WCIS includes

[1] A claims administrator is an insurer; a self-insured, self-administered employer; or a third-party administrator.

[2] According to DWC, WC claims reporting for the First Report of Injury (FROI) is 91–92 percent complete (Division of Workers' Compensation, 2016a). See Table 2.4 for an estimate of missing medical data by injury year.

[3] These figures were obtained from DWC tables (Division of Workers' Compensation, 2016b).

Table 2.1. Nature of Injury in 2011—All Claims with FROI vs. Only Claims with Medical Data

Code	Nature of Injury	All Claims (FROI) (%)	Claims with Medical Data (%)
52	Strain	30.7	37.6
49	Sprain	10.7	11.0
10	Contusion	11.4	9.3
59	All Other Specific Injuries, NOC	8.3	7.5
40	Laceration	10.6	6.6
80	All Other Cumulative Injuries, NOC	3.5	5.2
28	Fracture	2.6	3.8
37	Inflammation	2.8	3.1
90	Multiple Physical Injuries Only	3.1	3.1
43	Puncture	3.4	2.0
78	Carpal Tunnel Syndrome	0.7	1.4
77	Mental Stress	1.7	1.3
25	Foreign Body	2.2	1.3
04	Burn	1.5	0.9
16	Dislocation	0.3	0.8
13	Crushing	0.8	0.7
34	Hernia	0.6	0.6
91	Multiple Injuries Including Both Physical and Psychological	0.3	0.4
07	Concussion	0.3	0.3
01	No Physical Injury	0.8	0.3
71	All Other Occupational Disease Injury, NOC	0.4	0.3
68	Dermatitis	0.6	0.3
36	Infection	0.5	0.3
	All others	2.1	2.0
	TOTAL	100.0	100.0

NOTE: NOC = not other classified.

both insurer and self-insured medical-only claims as well as indemnity claims. To increase comparability between the two datasets, we included only WCIS insurer data and reclassified the specialty designations to be consistent with the WCIRB to the extent feasible. However, important distinctions remain. The WCIRB data categorize services according to the provider who received the payment. For example, payments for physician-dispensed pharmaceuticals, supplies, and equipment are included in the WCIRB physician payments but are not captured in our WCIS physician file; instead, our file includes only drugs that are physician-administered and other items used during an encounter. If we are willing to assume that the WCIRB represents the universe of insurer claims—that is, it captures insured claims not reported to the WCIS, and the distribution of specialty payments is similar between the WCIS and the WCIRB—this increases our confidence that our claims are representative of all claims in California (Table 2.2).

Table 2.2. Percentage of Payments by Physician Specialty, WCIS and WCIRB

Specialty	WCIS (%)	WCIRB (%)
General & Family Practice	22.4	20.5
Surgery[a]	14.9	13.8
Physical Therapist	7.4	9.1
Physical Medicine & Rehabilitation	5.7	4.8
Occupational Medicine	4.2	2.3
Chiropractic Providers	3.9	4.7
Anesthesiology	3.3	2.9
Radiology	3.1	5.4
Psychology	2.0	1.8
Internal Medicine[b]	2.0	1.3
Acupuncturist	1.3	1.1
Neurology	1.3	1.2
Emergency Medicine	0.9	0.9
Psychiatry	0.7	1.6
Podiatrist	0.5	0.4
Pathology	0.4	0.8
Marriage, Family, and Child Counselors	0.1	0.1
Ophthalmology	0.1	0.1
Dental Providers	0.1	1.0
Dermatology	0.1	0.1
Optometrists	0.0	0.1
Clinical Social Workers	0.0	0.0
All Other Providers[c]	25.5	26.0
Total	100	100

[a] We aggregated the following specialties in the WCIRB table to create the surgery category: orthopedic surgery, general surgery, hand surgery, plastic surgery, and neurosurgery.
[b] In the WCIRB, we included osteopaths in the Internal Medicine category to make it comparable to the WCIS.
[c] Specialties that we could not match in both datasets were folded into the "All Other" category. Fifteen percent of payments in the WCIRB table were to unknown or unclassified specialties.

The evidence in Tables 2.1 and 2.2 suggests that the WCIS data can be assumed to be broadly representative of all WC claims in California. A third issue is the completeness of the data. To assess this, we first compared the number of claims reported to the WCIS by insurers with those reported by the WCIRB (Table 2.3). Both counts include medical-only claims as well as indemnity claims. The WCIRB claim counts are by policy year (injuries covered by a policy incepting in a given calendar year), while the WCIS counts are by accident year (injuries occurring in a given calendar year), so the time periods for the measures are not identical. The WCIS compensable claim counts from the FROI are higher than those reported by the WCIRB:

Table 2.3. Comparison of WCIS and WCIRB Insured Claim Counts

Year	Number of WCIRB Claims	Number of WCIS: FROI Claims
2007	412,568	446,194
2008	358,077	410,087
2009	331,134	351,756
2010	335,912	351,905
2011	335,734	346,547
2012	343,571	355,015

SOURCES: RAND Analysis of First Report Claims Counts (WCIRB Summary of Policy Year Statistics, various years); WCIS compensable insured claim counts (DWC, 2016b).

8 percent higher in 2007, 15 percent higher in 2008, and 3–6 percent higher in 2009–2012. It is likely that denied claims are underreported in the WCIS, which would lead to an overestimation of compensable claims (total FROI counts minus denied claims) using WCIS data. At the same time, small medical-only claims may be underreported in the WCIRB data (WCIRB, 2014b). If these claims were fully reported in the WCIS, the differences between claim counts would be diminished.

Of greater concern is the percentage of claims in the WCIS data for which there are no WCIS medical data (Table 2.4).[4] Two reporting compliance issues identified by DWC are (1) nonreporting of medical data and (2) inaccurate reporting of the jurisdiction claim number (JCN), which is required to link medical data to the FROI. The decreasing percentage of WCIS claims with matched medical data is largely attributable to an increase in the submission of medical data that do not match the DWC-assigned JCN. Across the injury years, medical/FROI matching rates are about 20 percent higher for insurers than for self-insured employers (data not shown).[5] When both the matched and the unmatched claim counts are taken into account, there is an improvement in the percentage of claims for which medical data are reported.

[4] First-aid-only claims are unlikely to account for the difference because these claims are likely to be missing from both the FROI and medical data. Labor Code section 5401 defines first aid as any onetime treatment and related follow-up observation visit for minor scratches, cuts, burns, splinters, or other minor occupational injuries that do not ordinarily require medical care even if the care is provided by a physician or other registered professional personnel. Regulations section 14311(c) specifies that the cost of first-aid care may not exceed $700. A Doctor's First Report is required for first-aid claims, but the employer need not file a FROI. In addition, because the employer pays the provider directly rather than submitting the first-aid service as a medical expense to the payer, the bills would not be captured in WCIS and do not count against the employer's experience rating.

[5] Changes made in the California version 2.0 medical data requirements should eliminate any invalid JCN reporting and increase the match rates significantly. Penalties for incomplete WCIS reporting are also being implemented.

Table 2.4. Comparison of WCIS FROI Systemwide New Claim Counts with Matched and Unmatched Medical Data Claim Counts, 2007–2012

Year of Injury	Number of FROI New Compensable Claims	Medical Claims				Total Medical Claims as Percentage of FROI	Matched Medical Claims as Percentage of FROI
		Number of Matched Claims	Number of Unmatched Claims	Total Number of Claims	Percent Matched		
2007	710,893	502,478	76,076	578,554	86.9	81.4	70.7
2008	658,207	445,992	97,845	543,837	82	82.6	67.8
2009	577,608	388,826	101,275	490,101	79.3	84.9	67.3
2010	571,313	319,795	178,181	497,976	64.2	87.2	56
2011	551,971	306,900	188,447	495,347	62	89.7	55.6
2012	534,873	316,199	171,685	487,884	64.8	91.2	59.1
Total 2007–2012	3,604,865	2,280,190	813,509	3,093,699	73.7	85.8	63.3

SOURCE: WCIS analysis provided to RAND by DWC staff in May 2014.
NOTE: These claim counts predate the data update used in our analyses (September 2016). The matched claim counts are higher than those used in the Chapter Four monitoring tables (see Appendix B, Table B.5) because they are not contingent on the claimant having used a medical service within six months of date of injury.

Our analyses assumed that the WCIS data are representative. Our general approach to addressing the underreporting and nonmatching issues was to examine spending and utilization on a per-claim basis or as a percentage of total spending for matched claims. The underlying assumption is that if medical data are reported for a claim, the reporting is complete for that claim. To the extent there is systematic underreporting or nonmatching rates across different types of payers or types of services, the results may be biased.

The WCIS data are constantly being updated, so our findings are a snapshot based on when the study file was extracted from the WCIS. Our data file was created in September 2016. While we believe that our 2012 WCIS study data are nearly complete, we may be missing some services delivered to injured workers in 2012 (largely because of match rates), and claim counts for the medical data may change. In particular, this could affect our reported statistics calculated within 12 months of injury for 2012 injuries in the Chapter Four monitoring tables. The result would be downward biased utilization and spending statistics for 2012 injuries.

Chapter Four explores differences in utilization and spending by claim and payer characteristics. Trend comparisons between self-insured and insured status may be affected by employer changes in insured/self-insured status. Also, in small regions, the dominance of an insurer or a self-insured employer can affect the trends in that area.

For specific analyses, we supplemented the WCIS with information from other data sources. For example, in examining the drivers of WC spending growth (Chapter Three), we relied

primarily on data for WC insured claims, which are publicly available from the WCIRB. In examining monitoring trends (Chapter Four), we used U.S. Census Bureau data to classify services into geographic regions. The methods that we used for specific analyses and supplemental data sources are discussed in greater detail in the relevant chapters of the report.

3. Decomposing Spending Trends

Introduction

While the impact of medical spending growth on employers, on insurers, and on the stability of the entire WC system is clear, the drivers of WC medical spending growth are not as well understood. This chapter identifies and characterizes several potential drivers of medical spending growth: changes in number of WC claims, injury mix, and medical price inflation from 2007 through 2012. Our primary goal is to decompose changes in medical spending across these observable drivers. We attribute any residual, unexplained change to more elusive drivers such as changing practice patterns, intensity of care, and unmeasured changes in types of injuries. The distinction between observable and unobservable drivers of medical expenditures is of importance to policymakers for two reasons. First, the impetus to reform WC in response to medical spending growth may differ if a major portion of growth is easily explained or even anticipated. Second, optimal reform tools will vary depending on the source of growth.

Analytic Approach

Framework

Our objective was to decompose the annual changes in spending for medical services furnished in 2007–2012. Conceptually, medical spending in a given calendar year involves expenditures on injuries of various vintages, some of which just recently occurred and others of which occurred years (and possibly many years) in the past. Medical spending for services furnished over a fixed time period (t) for claims arising in a given injury year (y) can be represented as the product of the number of workers with WC coverage (N), the probability of injury of type i ($\Pr(I)$), and the average medical spending per injury (M) during the time period:

$$Medical\ Spending_{yt} = \sum_{i=1}^{I} N_y * \Pr\left(I_{yi}\right) * \overline{M_{yt\iota}/I_{y\iota}}$$

This statement illustrates several important determinants of aggregate WC medical spending. First, the number of employees (N) may change from period to period. Holding all else constant (and with a positive probability of injury and per-injury medical spending), increasing the number of covered employees will increase total medical spending. Second, a higher probability of a work-related injury or illness ($\Pr(I)$) will increase total medical spending,

and conversely, a lower probability of injury or illness will reduce total medical spending. Average medical spending may vary across the nature of injuries and affected body parts, so the injury probability should be differentiated by type. Finally, greater average medical spending per injury will increase total medical spending.

The average medical spending per injury is itself determined by three separate factors: price, volume, and "intensity." Price is the amount paid by the WC payer (insurer or self-insured employer) to health care providers. Volume represents the number of medical services and items provided. Intensity reflects the mix of services provided. While prices and volumes are amenable to measurement, intensity is more difficult to quantify.[1]

Finally, our framework accounts for the injury year composition of medical spending in each calendar year. In any year, total spending is the sum of the spending on injuries of various vintages.

$$Total\ Medical\ Spending_t = \sum_{y=1}^{I} Medical\ Spending_{yt}$$

Total medical spending in year (t) includes some spending on new claims in that calendar year, as well as spending on claims with previous injury years. For example, if there is an increase in the number of WC claims in a year, the increase affects only a portion of the change in medical spending in that year (since there is also spending for earlier injuries in that year) but also affects medical spending in future years. Spending in a given calendar year may also be affected by the timeliness of payments for services provided during that year. That is, some portion of spending in a given calendar year may be services provided in a prior year, and some services furnished during the year may not be paid for until a subsequent year. Because we are interested in decomposing spending for medical services, our framework considers changes in spending by *service year*, or payments for services delivered in a given calendar year regardless of when payment was made for the services. We define both the service year and the injury year on a calendar-year basis. Generally, it is reasonable to assume that the proportion of unpaid services from one service year that are paid in the subsequent year remains relatively consistent year to year.[2]

We consider three explicit drivers of medical spending for services provided in 2007–2012: (1) changes in prices paid for medical services, (2) changes in the incidence of new WC claims,

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[1] Health care payers often convert activities into relative value units to convert intensity into a measure of volume.

[2] Assuming that the proportion of unpaid services furnished in prior years that carry over to a subsequent year remains about the same, the distinction between service year and payment year is not significant. An exception might be when there are changes in administrative processes that lessen the time required to resolve medical necessity and payment disputes.

and (3) changes in injury mix. Other drivers affecting medical spending per claim are captured in residual medical expenditures after we estimate the fraction of total medical spending growth explained by each of the other drivers. The residual expenditures represent greater intensity in medical care (volume and mix of services) and therefore medical spending. There are various reasons for the residual, including changes in practice patterns, new technology, and an unobserved change in injury or illness severity. Illness severity can also contribute to the duration over which medical expenses are incurred for an injury. In Chapter Four we explore utilization and cost trends that inform the causes for the residual.

We considered whether to include changes in injury type (medical only, temporary indemnity, and permanent indemnity) as a separate cost driver. We found that we were not able to reliably distinguish these claims in the WCIS medical data. To some extent, however, changes in the injury types are implicitly captured in the changes in the injury mix.[3]

We also considered whether to include changes in industry sector or occupational mix as another cost driver. We concluded that the effects of these changes are largely accounted for in the changes in the incidence of new WC claims and in injury mix. Because our objective is to explain the changes in WC medical spending (rather than the causes for the observed changes in WC claims rates and injury mix), we do not include the changes in industry sector mix as a cost driver.

Sources for California WC Data

Based on our findings in Chapter Two that the WCIS data are incomplete, we relied on information generated by the WCIRB to estimate total medical spending. Insurance companies are required by statute to report medical and indemnity costs to the WCIRB. The WCIRB does not collect data from private or public employers that self-insure to provide WC benefits or from the State of California, which is legally uninsured. We followed the approach used in the Commission on Health and Safety and Workers' Compensation (CHSWC) annual reports, and generated systemwide estimates based on the insured market share of WC claims reported in the WCIS using a three-year moving average. The limitation of this approach is that it assumes the insured market is representative of WC claims from self-insured employers and the State of California. Our findings from the monitoring system discussed in Chapter Four suggest that there may be systematic differences in medical spending by payer type.

[3] An alternative would have been to incorporate the WCIRB medical-only claims statistics into our estimations. However, these are overall estimates that break down only indemnity claims by nature of injury or body part. Making this adjustment would have required us to also use the WCIRB estimates for changes in injury mix for indemnity claims, which may not be representative of systemwide claims.

The WCIS has the advantage of including systemwide WC claims data. We used the WCIS data to estimate the impact of changes in the incidence of new WC claims and injury mix on spending by service year. Because WCIS medical data were not collected until September 2006, we used service year 2007 as our base year and decomposed changes that occurred in medical spending in 2008–2012 relative to 2007.

Methods

Estimate of California WC spending for medical services. We based our estimates of California WC spending for medical services (Table 3.1) on WCIRB annual reports on California WC losses and expenses that are released in June (WCIRB, 2008–2013). We found that the reported medical spending for a given year sometimes changes between the first report for which the data are reported and subsequent reports that also include spending data for the same year. We used the latest published estimate for each year. We converted the WCIRB estimates into statewide estimates based on a three-year rolling average of the insured market share reflected in the WCIS data posted on the DWC website.[4] Effective with policy years

Table 3.1. Systemwide Medical Expenses in 2007–2012 (in millions of dollars)

Service Category	2007	2008	2009	2010	2011	2012
Physicians/Other Professionals	2,205	2,235	2,265	2,280	2,432	2,584
Hospital	1,470	1,639	1,510	1,672	1,333	1,336
Pharmacy	512	507	513	550	594	635
Medical-Legal Evaluation	221	301	242	257	277	292
Other (capitated medical)	12	21	5	8	26	8
Medical Services Spending Subtotal	4,419	4,702	4,535	4,767	4,662	4,855
Direct Payments to Patient	826	995	1,247	1,249	1,672	1,976
Total	5,245	5,698	5,782	6,016	6,334	6,831

SOURCE: RAND estimates based on WCIRB annual Reports on California Workers' Compensation Losses and Expenses and three-year moving average of insured market share calculated from FROI claim counts downloaded from the WCIS website as of January 11, 2017. Calculated adjustment factors to generate statewide estimates are as follows: 2007, 1.47; 2008,1.49; 2009,1.51; 2010–2012,1.52. Estimates do not include medical cost containment expenses or Medicare set-aside amounts but do include payments for medical liens.

NOTE: Sum of individual lines may differ from subtotals or totals because of rounding.

[4] Our method mirrors the method that CHSWC uses in its annual reports but uses more recent WCIS data to estimate market share and the last estimate for a given policy year. For example, the 2012 estimate is based on the spending estimate for the WCIRB report for policy year 2013 (released in June 2014).

beginning July 1, 2010, medical cost containment expenses that can be allocated to a particular claim are considered allocated loss adjustment expenses; for earlier policy years, these expenses are classified as medical expenses.[5] To develop a consistent annual medical spending cost measure across 2007–2012 that could also serve as a baseline for understanding future trends in medical expenses, we excluded medical cost containment expenses from our measure of annual medical spending. We also excluded amounts reported as Medicare set-asides and other Medicare-related payments beginning in 2012.

Below, we present an overview of how we derived an index measuring the change in each cost driver relative to 2007. Appendix A (Section A) contains a summary of the data sources used to develop each trend.

Changes in the prices paid for medical care. California WC medical spending data reported in Table 3.1 are in nominal terms; they do not reflect "real" changes in prices over time (which account for price inflation/deflation). The main disadvantage of nominal spending data is that they are not directly comparable over time. Nominal spending data can be converted to "real" dollar figures that control for variation in the value of money over time and are comparable over time. These conversions require an appropriate price index.

To estimate the changes in payments for medical services relative to 2007 that are attributable to inflation, we constructed a price index that measures California WC–specific price changes. The index accounts for changes in the OMFS and medical-legal fee schedule from 2007 through 2012.[6] We constructed one price index for medical services and a second index for direct payments to individuals.

For the medical service categories, we constructed an overall price index that takes into account for each service category any fee schedule changes from 2007 to 2012 and its share of total estimated spending in 2007. No changes occurred in the medical-legal fee schedule after July 2006 when the fee schedule allowances were increased 25 percent. For professional services, the only OMFS change occurred in 2007 when the allowances for evaluation and management (E&M) services were increased to Medicare fee schedule levels. We used the Workers' Compensation Research Institute's California-specific price index for professional services (Yang and Fomenko, 2014) to account for the changes in fee schedule allowances for professional services. Other than physician services, there were regular inflation updates in the OMFS from 2007 to 2012. For hospital services, we measured the annual changes in the

[5] Medical cost containment expenses include bill auditing expenses, utilization review costs, access fees to utilize medical provider networks and other managed care organizations, and the costs of medical management exclusive of direct case management (WCIRB, 2015). There has been significant growth in these costs as well. For insured claims, the WCIRB estimates that total medical cost containment expenses costs increased 68 percent between 2007 and 2012 (WCIRB, 2008–2013).

[6] More than 95 percent of medical spending is covered by a fee schedule. The percentage fluctuated over 2007–2012 from a low of 0.894 in 2009 to a high of 0.969 beginning in 2011. Source: WCIRB (2014a), Attachment B, Exhibit 4.2.

conversion factors used to establish the OMFS allowances for inpatient and outpatient services.[7] Our measure accounts for changes in payments to hospitals attributable to inflation but does not capture the effect of other changes in the hospital fee schedule, such as in the wage index used to adjust payments for geographic cost differences. We derived our inflation factor for pharmaceuticals by equally weighting the annual changes in the producer price index for pharmaceutical and medicine manufacturing and for pharmacies and drug stores.

Payments to individuals include future medical expense settlement amounts, transportation costs, and payments for services that are not reported and billed by medical providers, such as payments to home care attendants hired by the injured worker. Most of these expenses are not reported in the WCIS medical data. We used the rate of change in the medical care component of the Consumer Price Index–All-Urban Consumers (CPI-MC) to account for inflation in these expenses and did not further decompose the increases that occurred in these costs from 2007 to 2012.

Change in incidence of new WC claims. The incidence of new WC claims is affected by changes in the number of covered employees, the number of hours worked, the composition of the workforce, and the effectiveness of worker safety programs, among other factors. In this study, our focus is on the effect of changes in the number of new claims on annual WCIS spending rather than the causes for those changes. We reviewed three potential data sources to measure changes in the number of new WC claims: the annual Survey of Industrial Illnesses and Injuries (SOII), WCIS, and WCIRB. Based on our review, we elected to use the WCIS counts of compensable claims to measure the trends in the incidence of new WC claims.

To develop estimates of the number of nonfatal workplace injuries and illnesses, the U.S. Bureau of Labor Statistics and the California Department of Industrial Relations conduct an annual SOII. The estimates are derived from a statistical sample of 16,000 employers in the state that maintain a log of their workplace injury and illness experience and report hours worked. Using the information gathered in the SOII, employment data primarily derived from the Bureau of Labor Statistics Quarterly Census of Employment and Wages are converted into annual average employment data per full-time employee, and the number of WC claims is estimated from the reported incidence rates (California Department of Industrial Relations, n.d.). An advantage of the SOII is that it includes estimates of full-time equivalence and claims incidence rates as well as estimates of new WC claims. However, there are concerns that the SOII understates workplace injuries and illnesses. The estimates of new WC claims are considerably lower than those developed from either the WCIS or WCIRB data.

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[7] Inpatient and outpatient hospital spending each account for approximately 50 percent of total hospital spending. Approximately 20 percent of hospital outpatient services are payable under the OMFS for physician services rather than the outpatient prospective payment system (OPSS). We adjusted the price index weights for hospital outpatient services used to calculate an overall price index accordingly.

The WCIRB claim counts are for insured claims only and are by policy year rather than injury year. The policy year may overlap calendar years (e.g., the policy may cover injuries occurring on or after July 1, 2012, through June 30, 2013), so an adjustment would be needed to align the new claim counts with injury year. In addition, we would need to adjust the WCIRB insured claim counts to a systemwide estimate based on the share of claims reported to the WCIS for each injury year.

The WCIS data collected from all payers can be categorized by the calendar year of injury, but there are shortcomings in the completeness of the data. DWC estimated that 87 percent of new WC claims were reported in 2012 (Division of Workers' Compensation, 2013). Because our focus is on the percentage change in the number of WC claims since 2007, the underreporting is not necessarily an issue unless there has been improved reporting over time that would distort the trend measure.

For purposes of our analysis, we report our results assuming the WCIS claim counts. Because of the importance of this cost driver, we compare results using the SOII and WCIRB insured claim counts in Appendix A (Section B).

Changes in the injury mix. Changes in both the nature of injuries (e.g., strains, sprains, fractures, and burns) and the affected body parts (e.g., head, neck, and upper extremities) have implications for medical spending. To measure the change in injury mix, we established 40 mutually exclusive combinations of nature of injury/affected body part groupings based on the FROI data reported in the WCIS, claims volume, and total spending for 2007 injuries. For each grouping of 2007 claims, we computed average real medical spending at 12-month intervals starting at 12 months from date of injury through 72 months from date of injury. We then calculated a relative weight for each of the 40 groupings at each maturity level by dividing the average real spending per 2007 injury (including closed claims) for the grouping by the average spending across all groupings. We used the relative weights for each grouping at different maturity levels to adjust post-2007 injury spending for differences in injury mix. Appendix A (Section C) contains further explanation on how the injury mix adjustments were determined.

Combined effects. Initially, we estimate the percentage change in spending attributable to each cost driver (price inflation, claims incidence, injury mix), holding the other cost drivers constant. We then estimate the combined effect of the cost drivers for each service year by multiplying the adjustment factor attributable to each cost driver by each other. This eliminates any interactive effects of the different cost drivers on medical spending. For example, the inflation estimate assumes the WC claims volume remained constant at 2007 levels in subsequent years and overstates the proportion of the spending attributable to inflation because it does not account for the reduction in the number of WC claims in 2008 and later years.

Residual changes in medical spending. As noted above, our last cost driver is the residual changes after accounting for the other drivers. The residual reflects changes in service intensity

attributable to changes in the volume and mix of services, including new technology, and other factors such as any unmeasured changes in injury severity and claims duration.

Results

As a preview of our findings, Tables 3.2 and 3.3 decompose changes in WC medical spending across the cost drivers from 2008 to 2012 relative to 2007 spending. Table 3.2 reports the change in medical spending explained by the cost drivers as a percentage of total 2007 WC medical spending, while Table 3.3 presents the changes in dollar amounts.

In Table 3.2, we have broken total medical spending into two categories ("Spending for Medical Services" and "Payments to Individuals") and show for each category the percentage increases over 2007 spending in (a) actual spending levels, (b) expected spending levels based on inflation and changes in WC claims incidence and injury mix, and (c) residual spending levels. Spending for medical services over the period increased 9.9 percent; however, the expected increases from inflation and injury mix were not as great as the expected reductions attributable to declines in the number of new WC claims, resulting in expected reductions in spending each year. The "Residual Change" row is the percentage change in medical spending needed to move from the "Expected Change" rows to the "Actual Spending" rows. For example, 2012 spending on medical services was 9.9 percent higher than 2007 spending compared with an expected –2.4 percent reduction based on the cost drivers. The residual change (12.3 percent increase in spending over 2007 levels) is explained by other factors that are not accounted for in our model.

We report payments to individuals as a separate category because we do not have a breakdown of the payments by type of service that would allow us to decompose the spending increases by cost drivers other than general inflation. In the aggregate, payments to individuals increased 139.2 percent over the period, compared with an 18.2 percent increase that would be expected based on the increase in the CPI-MC. This leaves a 121.0 percent residual that is explained by other factors. Most expenses reported in this category are attributable to claims settlements, and it is likely that improved reporting of the portion of settlements attributable to medical expenses has fueled the increases rather than an actual increase in the number and size of the settlements.

The large residual in the "Payments to Individuals" category also affects the size of the residual in total medical spending, and so the results should be interpreted with caution. In the aggregate, 2012 spending was 30.2 percent higher than 2007 levels, while the expected changes in aggregate spending in each year are negligible relative to 2007. The residual change in "Payments to Individuals" accounted for 65 percent of the residual change in total medical spending (29.4 percent).

Table 3.2. Actual, Expected, and Residual Changes in Total Medical Spending by Service Year Relative to 2007 Systemwide Spending (percentage)

	2008	2009	2010	2011	2012
Spending for Medical Services					
a. Actual spending	6.4	2.6	7.9	5.5	9.9
b. Expected change	0.0	–0.3	–1.3	–2.4	–2.4
c. Residual change	6.4	3.0	9.2	7.9	12.3
Payments to Individuals					
a. Actual spending	20.5	51.0	51.2	102.4	139.2
b. Expected change	3.7	7.0	10.6	14.0	18.2
c. Residual change	16.8	44.0	40.6	88.4	121.0
Total Medical Spending					
a. Actual spending	8.6	10.2	14.7	20.8	30.2
b. Expected change	0.6	0.8	0.6	0.2	0.9
c. Residual change	8.0	9.4	14.1	20.6	29.4

Table 3.3 reports the same results in dollars. Here, we see that the residual changes in spending for medical services are negligible in 2008–2009 but become increasingly important as the cumulative effect of the reductions in new WC claims become greater than the expected increases attributable to inflation. The 2012 residual—$541 million—accounts for 11 percent of 2012 spending for medical services. As noted earlier, 65 percent of the 2012 residual for total spending is attributable to the increases in payments to individuals. To the extent these increases reflect reporting improvements rather than actual increases, the residual for total medical spending is overstated.

In the sections that follow, we present our results for each cost driver.

Changes in Prices for WC Medical Services

We developed a composite index to account for changes in the OMFS for different categories of medical services and used the medical component of the CPI-All Urban (Medical CPI) to adjust direct payments for individuals for inflation from 2007 to 2012. We adjusted the weights (each service category's proportion of total medical service spending) used in the composite index to account for slightly different rates of increases in inpatient and outpatient hospital services and the use of the physician fee schedule to pay for about 20 percent of hospital outpatient services. The latter adjustment increases the weight for physician services and reduces the weight for hospital outpatient services. Between 2007 and 2012, changes in the OMFS allowances to account for price inflation increased payments 8.8 percent (Table 3.4). In contrast, the Medical CPI increased 18.2 percent over this period.

Table 3.3. Actual, Expected, and Residual Changes in Total Medical Spending by Service Year Relative to 2007 Systemwide Spending (in millions of dollars)

	2007	2008	2009	2010	2011	2012
Spending for Medical Services						
a. Actual spending	4,419	4,702	4,535	4,767	4,662	4,855
b. Expected change		3	–14	–56	–105	–105
c. Residual change		280	130	404	348	541
Payments to Individuals						
a. Actual spending	826	995	1,247	1,249	1,672	1,976
b. Expected change		31	58	88	116	150
c. Residual change		138	363	335	730	1,000
Total Medical Spending						
a. Actual spending	5,245	5,697	5,782	6,016	6,334	6,831
b. Expected change		33	44	31	10	45
c. Residual change		419	493	740	1,079	1,541

Table 3.4. Price Indices Used to Account for Inflation in Prices Paid for Medical Services and Payments to Individuals

	2007	2008	2009	2010	2011	2012	Weight
Medical Services							
Inpatient Hospital Facility Fees	1.000	1.032	1.066	1.086	1.111	1.145	0.167
Hospital Outpatient/Ambulatory Surgery Center (ASC) Facility Fees	1.000	1.033	1.070	1.092	1.107	1.155	0.134
Professional Services	1.000	1.010	1.029	1.038	1.038	1.029	0.553
Drug	1.000	1.015	1.051	1.066	1.074	1.086	0.116
Medical-Legal	1.000	1.000	1.000	1.000	1.000	1.000	0.050
Composite Index	**1.000**	**1.015**	**1.051**	**1.067**	**1.075**	**1.088**	1.000
Payments to Individuals	**1.000**	**1.037**	**1.070**	**1.106**	**1.140**	**1.182**	1.000

Table 3.5 adjusts 2007 spending for inflation using the indices in Table 3.4. The difference between the inflation-adjusted spending in each service year and actual 2007 spending is the service year spending increase that is explained by inflation holding all other factors constant and before taking into account any interactive effects with other cost drivers. The last row of the table shows the combined inflation adjustment factor applicable to both medical services and payments to individuals. All else being equal, inflation would have been expected to increase total medical spending 10.3 percent in 2012 relative to 2007 spending levels.

Table 3.5. Service Year Spending Increases over 2007 Explained by Inflation, Holding All Other Factors Constant (in millions of dollars)

	2007	2008	2009	2010	2011	2012
Spending for Medical Services						
2007 spending adjusted for inflation	4,419	4,84	4,645	4,715	4,749	4,807
Spending increase explained by inflation	NA	65	226	296	330	388
Spending for Direct Payments to Patients						
2007 spending adjusted for inflation	826	857	884	914	942	976
Spending increase explained by inflation	NA	31	58	88	116	150
Total Medical Spending						
2007 spending adjusted for inflation	5,245	5,341	5,529	5,629	5,690	5,784
Spending increase explained by inflation	NA	96	284	384	445	539
Inflation adjustment factor for total medical spending	1	1.018	1.054	1.073	1.085	1.103

SOURCE: RAND 2007 spending adjusted for inflation derived by multiplying 2007 spending levels by the relevant index values in Table 3.4. The spending increase explained by inflation is the difference between the inflation-adjusted spending for a given year and 2007 spending.

Trends in Incidence of New WC Claims

This section explores trends in the incidence of new WC claims. Changes in the number of new WC claims during a calendar year are a function of changes in the number of full-time employees and the incidence rate for WC claims. The latter is affected by changes in the composition of the workforce—such as occupational and industry mix—and the effectiveness of safety programs, among other factors. Declines in both full-time employment and WC claims rates contributed to a decline in the number of new WC claims each year until 2012. In 2012, claims incidence rates did not change from 2011 levels, but higher employment led to an increase in the number of new WC claims.[8]

Table 3.6 summarizes the new claim trends found in the WCIS estimates for 2007–2012. The last column of the table translates these declines into an adjustment factor for injury year spending. All else being equal, expected injury year spending at a given maturity level would equal real spending observed for 2007 injuries at the same postinjury maturity level multiplied by the adjustment factor.

[8] Other than employment, wages are an alternative "input" into the WC system in the sense that they in part determine indemnity benefits received by injured workers. Wages (in the form of payroll estimates) are also used to calculate WC premium recommendations from WCIRB. Wages play a less direct role in medical spending and are not considered in our framework. Wage and medical spending may, however, be correlated if individuals with higher wages use more or more expensive medical care. Higher-wage workers may have access to more or more expensive care. Higher-wage workers may have more information regarding their medical treatment options than their lower-wage counterparts. Finally, higher-wage workers may be more likely to report injuries. This report does not explore these hypotheses.

Table 3.6. Number of New WC Claims, Calendar Years 2007–2012, Percent Change from 2007 Injury Levels, and Adjustment Factor for Injury Year Spending

Year	Number of New WC Claims (000s)	Number of Denied Claims	Number of New Compensable Claims	Percent Change from 2007	Adjustment Factor for Injury Year Spending
2007	726,460	56,751	669,709	—	—
2008	675,448	57,332	618,116	–7.7	0.9230
2009	602,118	57,833	544,285	–18.7	0.8127
2010	602,726	58,368	544,358	–18.7	0.8128
2011	594,242	60,113	534,129	–20.2	0.7976
2012	604,733	60,304	544,429	–18.7	0.8129

SOURCE: DWC FROI and Subsequent Reports of Injury (SROI) data summaries by year of injury as of January 11, 2017.

Table 3.7 shows in dollars and as an adjustment factor the expected impact on service year spending levels for changes in the number of post-2007 injuries holding all else constant to spending levels for 2007 injuries. Service year spending levels are composed of both claims for injuries occurring in 2007 and earlier and claims for injuries occurring post-2007. The adjustment factor applies only to the projected spending for post-2007 injury years. Before adjustment, the framework assumes that projected spending for post-2007 injuries would be the same as real spending for 2007 injuries at the same maturity level. Using the adjustment factors in Table 3.6, we make an across-the-board adjustment through 2012 to the projected spending for the post-2007 injuries that are represented in the service year spending. The service year adjustment factors shown in Table 3.7 are an average of the adjustment factors applicable to each post-2007 injury year weighted by its spending level in that service year.[9] We show the impact in dollars and as an adjustment factor. Both measures reflect the expected impact on the changes in the number of new WC claims on service year spending levels for injuries occurring in 2008 and later holding all else constant to spending levels for 2007 injuries. For example, holding all else constant, we would expect real service level spending in 2012 to decline to 81.3 percent of 2007 real spending levels.

[9] To develop the adjustment factor for a given service year, we first determined an unadjusted spending level that assumed that spending for post-2007 injuries in a given service year would be at the same level as spending for 2007 injuries at the same maturity level. For example, spending in postinjury year 2 (12–24 months) for injuries occurring in 2008 and later would be the same as spending in postinjury year 2 for 2007 injuries. We then multiplied the unadjusted spending level for an injury year in a given service year by the adjustment factor for that injury year. For example, expected spending in 2009 for post-2007 injuries would equal injury year 2007 spending in postinjury year 2×0.9230 (the 2008 adjustment factor) and injury year 2007 spending in postinjury year 1×0.8127 (the 2009 adjustment factor). The difference between the sum of the unadjusted and adjusted injury year spending levels provides an estimate of the impact of the changes in the number of post-2007 WC claims on spending in a given service year.

Table 3.7. Change in Service Year Real Spending Explained by Changes in Number of New WC Claims Holding All Other Factors Constant

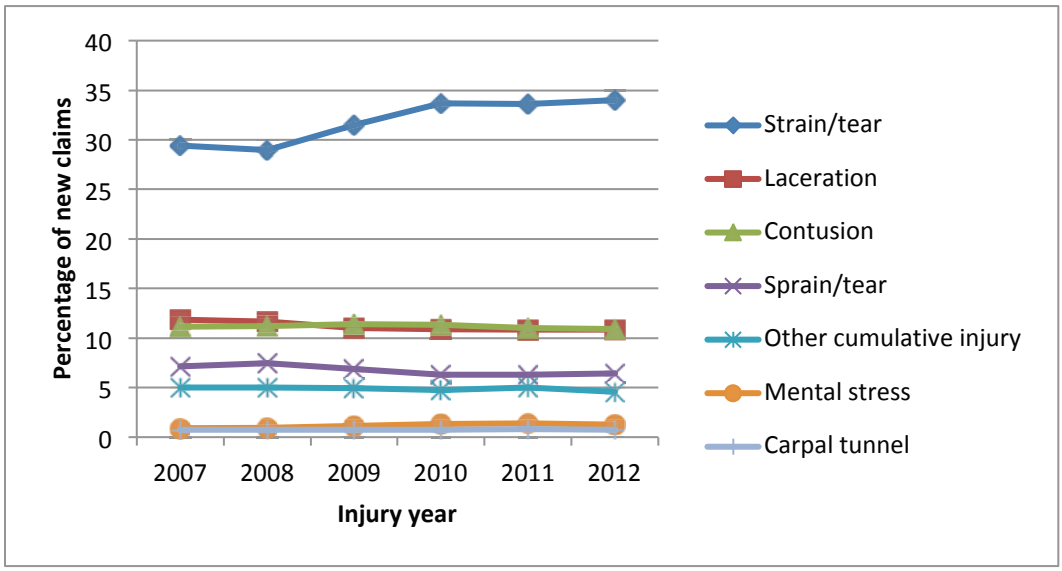
	2008	2009	2010	2011	2012
Impact ($mils)	–108.3	–352.7	–522.1	–654.8	–728.7
Adjustment factor applicable to service year spending for injury years 2008 and later	0.923	0.813	0.813	0.798	0.813

Trends in Injury Mix

This section explores changes in injury mix as a potential driver of spending for medical services. We defined injury mix as changes in the nature of injuries and in the affected body parts. We found few, relatively modest shifts over time in the distribution of new claims across the nature of injuries and affected body parts that contributed to changes in service year spending.

Injury mix remained fairly stable from 2007 to 2014 (Figure 3.1). The largest category of injuries—strains and tears—increased from 29 percent in the 2007 WCIS claims data to 34 percent in the 2012 data. The shares of other high-volume types of injuries changed less than 1 percentage point.[10]

Figure 3.1. High-Volume Injuries as Percentage of Total New Claims by Injury Year



[10] However, for the injury categories with a relatively small share of total injuries, a small percentage-point change in share can be significant. For example, mental stress claims increased from 0.9 percent to 1.2 percent of injuries, a 37 percent increase in its share of injuries.

The relatively minor changes in the distribution of claims mean that injury mix changes had a relatively minor impact on service year spending. When the costs for each category of injury are held constant at 2007 spending levels, the injury mix in subsequent years is slightly more costly than the 2007 injuries at various maturity levels. Table 3.8 shows injury year 2007 spending by maturity level and the adjustment factors for subsequent years that account for changes in injury mix. The adjustment factor at the first 12 months' maturity range increases from 1.003 in 2008 to 1.010 in 2011 and 2012, indicating that changes in injury mix explain less than a 1 percent impact on spending levels following 12 months from injury. The pattern of higher-cost case mix in the later injury years relative to earlier injury years is consistent across maturity levels. For example, the adjustment factor for incremental spending between 12 and 24 months is 1.005 for injury year 2008 and increases to 1.020 for injury year 2011. In Table 3.9, we show the effect of the differences in injury mix on service year spending holding other factors constant and as an adjustment factor. The adjustment factor reflects the expected impact of changes in injury mix on service year spending levels for injuries occurring in 2008 and later holding all else constant to spending levels for 2007 injuries.

Table 3.8. Injury Year 2007 Real Spending at Different Claim Maturity Levels and Adjustment Factors for Post-2007 Injuries Relative to Spending for 2007 Injuries

	Incremental Spending by Claim Maturity Levels				
	First 12 Months	13–24 Months	25–36 Months	37–48 Months	49–60 Months
Injury Year 2007					
Average spending per claim ($)	2,043	766	523	398	320
Average relative weight	1.0000	0.375	0.256	0.195	0.157
Injury Year Adjustment Factors					
2008	1.003	1.005	1.005	1.005	1.009
2009	1.006	1.015	1.015	1.013	
2010	1.005	1.018	1.016		
2011	1.010	1.020			
2012	1.010				

Table 3.9. Change in Service Year Spending Explained by Changes in Injury Mix Holding All Other Factors Constant

	2008	2009	2010	2011	2012
Impact ($millions)	2.9	10.1	18.7	31.3	43.9
Adjustment factor applicable to service year spending for injury years 2008 and later	1.002	1.007	1.008	1.010	1.013

Combined Effect of Inflation, Claims Incidence, and Injury Mix on Medical Service Spending

In the previous analyses, we estimated the effect of each cost driver independently, holding all other factors constant to 2007 spending levels. In our framework, service year spending for injuries occurring in 2007 and earlier is affected only by the inflation cost driver. We define the contribution of inflation to spending for these claims as the difference between nominal and real spending for the claims in each service year.

In addition to inflation, service year spending for injuries occurring in 2008 and later is affected by changes in the number of new WC claims each injury year and injury mix. We determined the combined effect of the adjustment factors by multiplying the three cost driver adjustment factors together (Table 3.10).

Table 3.10. Medical Service Adjustment Factors for Injuries Occurring in 2008 and Later

	Service Year Adjustment Factors				
Cost Driver	**2008**	**2009**	**2010**	**2011**	**2012**
Inflation	1.015	1.051	1.067	1.075	1.088
Incidence of new claims	0.923	0.813	0.813	0.798	0.813
Injury mix	1.002	1.007	1.008	1.010	1.013
Combined effect	0.939	0.905	0.892	0.883	0.894

We apply the combined adjustment factor to an estimate of aggregate service year spending for post-2007 injury year claims holding the spending level by injury year constant to spending for 2007 claims of the same vintage. This provides an estimate of the expected spending relative to 2007 levels based on the three cost drivers. Comparing the expected change in spending with the actual change provides an estimate of the change accounted for by the cost drivers relative to other factors. Table 3.11 summarizes our results. After accounting for the cost drivers, we expected medical service spending to be $105 million lower than in 2007; instead, spending was $436 million higher. This results in a residual change of $541 million that is attributable to other factors that are not accounted for in our framework.

Limitations

A challenge imposed by our framework is the need to convert the effects of the cost drivers on injury year spending into service year spending. Using the available data, we measured the effects on service year spending for injuries occurring in 2008 and later using spending for injuries occurring in 2007 as our baseline. For injuries occurring before 2007, we are only

Table 3.11. Contributions of Cost Drivers to Changes in Medical Spending, 2007–2012 (in millions of dollars)

	Service Year Spending				
	2008	**2009**	**2010**	**2011**	**2012**
Medical Service Spending					
Actual spending: total	4,702	4,535	4,767	4,662	4,855
Injury year 2007 and earlier	*3,226*	*2,164*	*1,802*	*1,519*	*1,311*
Injury year 2008–2012	*1,476*	*2,371*	*2,965*	*3,143*	*3,544*
Total spending change relative to 2007	283	116	348	243	436
Cost driver contribution: total	3	–14	–56	–105	–105
Injury year 2007 and earlier (inflation only)	*47*	*105*	*113*	*105*	*106*
Injury year 2008–2012 (inflation, claims, injury mix)	*–44*	*–119*	*–169*	*–211*	*–211*
Residual change	280	130	404	348	541
Payments to Individuals					
Actual spending	995	1,247	1,249	1,672	1,976
Spending change relative to 2007	169	421	423	846	1,150
Cost driver contribution (inflation only)	31	58	88	116	150
Residual change	138	363	335	730	1,000
Total Medical Spending					
Actual spending	5,697	5,782	6,016	6,334	6,831
Spending change relative to 2007	452	537	771	1,089	1,586
Cost driver contributions	33	44	31	10	45
Residual change	419	493	740	1,079	1,541

able to estimate what the service year real spending would have been in 2007 dollars. We are unable to measure the effect of changes in the types of claims or claims duration on spending.

Our investigation of the cost drivers was shaped by the data that were available to us. To the extent feasible, we used the WCIS data in our analyses. This raises several important limitations:

- As discussed in Chapter Two, the medical data are incomplete. To address this, we derived systemwide spending estimates that are based on annual medical expenditures reported by insurers to WCIRB. This is a common approach to estimating systemwide WC medical spending. However, the monitoring analyses described in Chapter Four suggest that the level of medical spending and distribution across type of service varies by payer status (see, for example, Figure 4.16). The data are not directly comparable, and additional analysis is needed to understand the extent to which this would change the systemwide estimates.
- Our estimate of residual spending is sensitive to the trend in the incidence of new claims. Each of the potential data sources that we considered has limitations. We chose to use the WCIS trend in new claims incidence. If we had chosen to use either SOII or WCIRB data to develop the trend in new claims incidence, our estimate of residual spending would be different. We provide a sensitivity analysis of the difference in Appendix A (Section B).

- We use the WCIS data primarily for our analysis on the impact of injury year differences in injury mix. The baseline for these estimates is spending for injury year 2007 in subsequent service years at different maturity levels. The incompleteness of the medical data is an issue. We computed spending on a per-claim basis and assumed that if medical data are reported for an injured worker, the reporting for that injured worker is complete; but this might not be the case. Moreover, if there are improvements over time in the completeness of the data for the 2007 injuries, our estimates of spending for 2007 injuries in subsequent years will be overstated and will affect our measure of changes in injury mix.
- We were unable to reliably identify the type of claim in the WCIS medical data (medical only, temporary indemnity, permanent indemnity). As a result, we could not investigate whether a change in type of claim after accounting for changes in injury mix is an important cost driver. The WCIRB data indicate that there has been a decline in medical-only claims between 2007 and 2012 and an increase in both temporary and permanent indemnity claims. Average medical spending on indemnity claims is much higher than for medical-only claims, suggesting that the residual spending estimate may be affected by changes in type of claim that are not accounted for in changes in the nature and type of injury. See Appendix A (Section E) for an analysis of publicly available WCIRB data on changes in the type of insured claims.
- We did not analyze whether changes in the distribution of claims across industry sector and occupations are important cost drivers after accounting for changes in incidence of new claims and injury mix.[11]

Another important limitation is the lack of data on the various components making up the payments to individuals. These payments increased 139.2 percent over the period and accounted for 65 percent of the residual in total medical spending.

Key Findings

- Medical service spending increased 9.9 percent from 2007 to 2012. After accounting for the measured cost drivers in our framework (inflation, new WC claims, and injury mix), the predicted change over the period is –2.4 percent. This creates a residual spending increase of 12.3 percent in 2012 that is attributable to unmeasured changes in intensity of services and injury mix.

[11] We know, for example, that employment losses in the construction industry were substantially higher (34 percent) than the overall losses in the civilian workforce (2 percent) over the 2007–2012 period and that the proportion of civilian workers in the construction industry fell from 5.3 percent in 2007 to 3.6 percent in 2012 (RAND analysis of EDD, Labor Market Information Division data, 2015).). From the WCIRB data, we know that the percentage of medical spending on indemnity claims for the construction industry fell from 17 percent in 2007 to 15 percent in 2012. We believe that the effects of these changes are largely accounted for in the changes in the incidence of new WC claims and in injury mix. The WCIS FROI data are missing about 13 percent of industry codes and 9 percent of occupational codes.

- For injury years 2007 and earlier, we measured only the difference between real and nominal spending on medical services. About 8.8 percent of 2012 service year spending for these injuries can be attributed to inflation.
- For injuries occurring in 2008 and later, we predicted the effect of the three cost drivers on medical service spending. For service year 2012, we estimated the following for these claims:
  - Inflation increased spending 8.8 percent relative to 2007 levels.
  - Changes in the number of new WC claims rates for injury years 2008–2012 reduced 2012 service year spending by 18.7 percent relative to 2007 holding all other factors constant.
  - Changes in injury mix increased 2012 service year spending 1.3 percent relative to 2007 levels holding all other factors constant.
  - The combined effect of these cost drivers reduced service year spending 10.6 percent relative to spending levels for 2007 claims.
- The residual change in systemwide spending is large: $1.5 billion. This represents about 23 percent of total 2012 service year spending and nearly all of the increase in spending in service year 2012 relative to 2007. The increases in payments to individuals account for 65 percent of the residual. To a large extent, these increases may be attributable to improved reporting of further medical expenses in claims settlements.

Discussion

Our objective was to explore whether the WCIS can be used to decompose systemwide annual changes in medical spending. Often, trends in aggregate WC medical spending are made using a national inflation index such as the Medical CPI. These comparisons are misleading for the 2007–2012 period for several reasons. First, the growth trend in the California WC program is expected to be lower over the 2007–2012 study period because of no increases for inflation in the OMFS for physician services and medical-legal expenses. Second, the declines in the incidence of new claims were significant and affect spending not only in the injury year but in subsequent years as well. Third, improved medical reporting (such as for settlement amounts attributable to future medical expenses or for medical liens) may overstate the actual increases in medical spending.

Our analyses provide a framework for evaluating trends in aggregate nominal spending. While there are limitations to our methods and room for refinement, our overall finding with respect to spending for medical services is unlikely to change, namely, annual spending increases over the 2007–2012 period are largely unexplained after accounting for inflation and changes in WC claims incidence and injury mix.

In our framework, we use the term “intensity” for the cost driver that accounts for the residual change. It captures changes in both the volume and mix of medical services and unmeasured injury mix and severity. The contribution of the intensity cost driver to aggregate spending for medical services highlights the need to examine changes in volume and mix of

services and to improve injury mix measures. In Chapter Four, we measure the extent to which per-claim spending changes are attributable to changes in utilization patterns, including changes in the type of services and in the volume and mix of services within service categories, and to changes in payment levels for those services. We examine costs and utilization by types of injuries and payers, and in doing so provide a foundation for future analyses that could be used to refine the framework.

Our results indicate the increases in payments to individuals are an important component of the total medical spending increases. Because those expenses are typically not captured in the WCIS medical data, other data sources will be needed to better understand the composition of those expenses and the extent to which the spending growth represents actual changes in spending levels or improvements in how the portion of lump-sum settlements attributable to future medical expenses is reported. In the interim, caution should be used in interpreting trends in total medical spending.

4. Monitoring Trends in Utilization and Spending and Return-to-Work Outcomes

Introduction

An earlier RAND study recommended that the California WC system develop an ongoing monitoring system for WC medical care and laid out a framework for doing so (Wynn, Timbie, and Sorbero, 2011). This study takes the recommendation to the next stage and develops a monitoring system that tracks changes in utilization, spending, quality, access, and return-to-work measures over injury years 2007–2012. In this chapter, we first summarize our general analytic approach for the monitoring analyses. We then describe the methods underlying our utilization, spending, and return-to-work measures and discuss key results for these measures. Per-claim trends in these domains are most likely to inform the reasons for the residual spending increases identified in Chapter Three. In Chapter Five, we describe our measures and key results for the quality measures used in our monitoring analyses. In Chapter Six, we describe our monitoring measures and results related to access to medical care.

Analytic Approach

The monitoring analyses track many individual measures across five domains: utilization, spending, quality, access, and return to work. Our goal was to track the patterns and trends in these domains for injury years 2007–2012 using measures based on injury year. Within each domain, we were interested in identifying—through both formal statistical testing and qualitative analysis—whether there are overall trends and trends by claim characteristics. Any number of measures might be used in an ongoing monitoring system. We selected measures a priori that we thought might facilitate understanding observed changes in WC medical care and outcomes. With the exception of our return-to-work measure, we limited our selection to measures that could be generated using the WCIS medical data.[1]

[1] One of our goals was to explore the impact of medical provider networks (MPNs) on the patterns and trends; however, we found that MPN status was not reliably reported in the WCIS data. As a proxy for MPN care, we constructed measures that examined claims by the proportion of care that was provided under contract, but found that the overall proportion of contract care is significantly lower than the WCIRB estimate for insured claims. We do not report the results for these measures pending further analysis of potential reasons for the differences.

Data

See Chapter Two for a general description of the WCIS data that we used for these analyses. We arranged the WCIS data to follow individual injured workers from date of injury through either 12 or 24 months postinjury. We categorized injured workers by injury year, region, injury condition, and payer category for subgroup analyses as described in more detail below.

Our return-to-work measure uses wage earnings data maintained by the California Employment Development Department (EDD). Employers covered by unemployment insurance report quarterly earnings for each of their employees to EDD. Because the industries covered by WC are comparable to those covered by unemployment insurance, a WC claimant should have a record for the quarter of injury in the EDD data and should also have a record in any subsequent quarters in which the claimant had earnings from the same or a different employer. DWC facilitated obtaining the EDD quarterly earnings data and linking them to WC claims in the medical data.

General Methods

All our analyses track medical services and spending by the JCN assigned to each WC claim. All claim counts are based on the JCNs that are in the medical data and received a service within six months of injury. This is a subset of the claims that are reported to the WCIS through the FROI (see Chapter Two) and have medical data.

We calculate measures at different time periods after the date of injury. For most measures, we use medical services reported in the WCIS with a date of service that was within 12 or 24 months of the date of injury. We are able to calculate measures with a 12-month time horizon for injuries occurring in 2007–2012 using our 2007–2013 WCIS data, and measures with a 24-month time horizon for injuries occurring in 2007–2011. EDD data for the return-to-work analyses were available for this study through 2011 only.

We used the characteristics of the claims to stratify the JCNs into subpopulations to assess utilization and spending differences by claim characteristics. In addition, we used two denominators for each utilization and spending measure. The first denominator includes all JCNs in the subpopulation of interest (e.g., all JCNs with shoulder injuries in a given year) and produces a per-claim measure of spending or utilization. The second denominator includes only those JCNs in the subpopulation of interest that utilized the service (e.g., all JCNs with shoulder injuries in a given year that had an inpatient hospitalization) and produces a per-user measure that is conditional on the claimant using the relevant service one or more times.

Claim Characteristics

Type of injury: Because overall measures across the injury years are also affected by changes in injury mix, we examined separate measures for four selected types of injuries: lower back pain, shoulder, knee, and upper back/neck. We selected the four types of injuries based on

interviews with several medical directors at the outset of the study concerning common WC injuries with multiple medical treatment approaches, measurement issues, and our review of relevant quality measures that could be generated from administrative data for selected conditions. We assigned each JCN to one of five injury categories (lower back, shoulder, knee, upper back/neck injury, or other) using diagnosis codes listed on medical bill lines, excluding lab/pathology and diagnostic radiology lines. The algorithm for assigning JCNs is described in Appendix B, Table B.1.

Geographic area: We examined differences in patterns and trends across geographic regions. Higher utilization and spending in Southern California relative to Northern California is well documented in other studies. Differences in trends across geographic regions inform the extent to which certain areas of the state may be driving the increases in medical spending per claim that are not accounted for by other cost drivers (Chapter Three). We assigned each JCN to one of 11 regional areas based on the zip code of the injured worker's residence. We used the regions that DWC uses for reporting WC program statistics: Bay Area, Central Coast, Central Valley, Eastern Sierra Foothills, Inland Empire, Los Angeles, North State-Shasta, Sacramento Valley, Sacramento Valley-North, San Diego, and out-of-state. In addition, we assigned JCNs based on location to either Northern or Southern California locations.

Payer: We categorized each JCN by whether the employer is insured or self-insured. We included the State of California (which is technically uninsured) in the self-insured category. The WCIS includes information on whether the employer is self-insured. DWC provided a file with an indicator for state employers in 2010, which we expanded to earlier years based on employer name. Because the WCIRB obtains data from the insured market only, any differences are important not only in themselves but also in developing reliable estimates of statewide measures using the WCIRB data.

Medical Service Characteristics for Spending and Utilization Measures

Type of service: We categorized services using the procedure code on the claim line, the bill type (facility or physician/other practitioner/supplier), and place of service codes. In some cases, we assigned a claim line to "level 1" and "level 2" hierarchical categories. Our service categories for professional codes follow the Current Procedural Terminology (CPT) code categories. For example, the medicine category (CPT codes 90291-99607) includes a broad array of services, such as different types of nonradiologic diagnostic tests, physical therapy, and reports. Appendix Table B.2 lists the categories by CPT code. Note that the "Outpatient Facility Services" and "Inpatient Hospital Stays" categories include only services for which there are OMFS facility allowances (emergency department visits and outpatient hospital/ASC facility services). Bill lines for professional services and other services furnished in hospital outpatient settings (e.g., diagnostic radiology) are included in other categories as appropriate based on the procedure code.

We do not report utilization or spending for anesthesia, durable medical equipment, prosthetics services, alphanumeric codes, or miscellaneous services as separate categories in this report chapter. These services represent a relatively small percentage of total medical expenses. However, we do include spending for these services as well as services that we are unable to classify (including liens) in our estimates of total spending per claim. Although laboratory services are also a relatively small percentage of expenditures, we report measures for these services because we found significant growth in utilization and spending.

Provider specialty: We categorized providers by the rendering bill provider taxonomy code. We defined primary care providers (PCPs) as multispecialty group practices and individuals or group practices in general internal medicine, general and family medicine, and occupational health. The specialty crosswalk is in Appendix B, Table B.3.

Measure Descriptions

Our monitoring tables and figures report summary statistics from three main measures:

Utilization by service category

Definition: Count of units of service per JCN in either the first 12 or 24 months after injury.

Denominator: All JCNs (unconditional) or JCNs with utilization in a given period (conditional).

Spending by service category

Definition: Sum of claim paid amounts per JCN in either the first 12 or 24 months after injury.

Denominator: All JCNs (unconditional) or JCNs with utilization in a given period (conditional).

Return-to-work measure: Employment at quarters 1–8 postinjury

Definition: This measure reports the proportion of injured workers who report nonzero wages at any firm at a given quarter postinjury. Wage information history is obtained from the EDD wage files.

Denominator: All JCNs

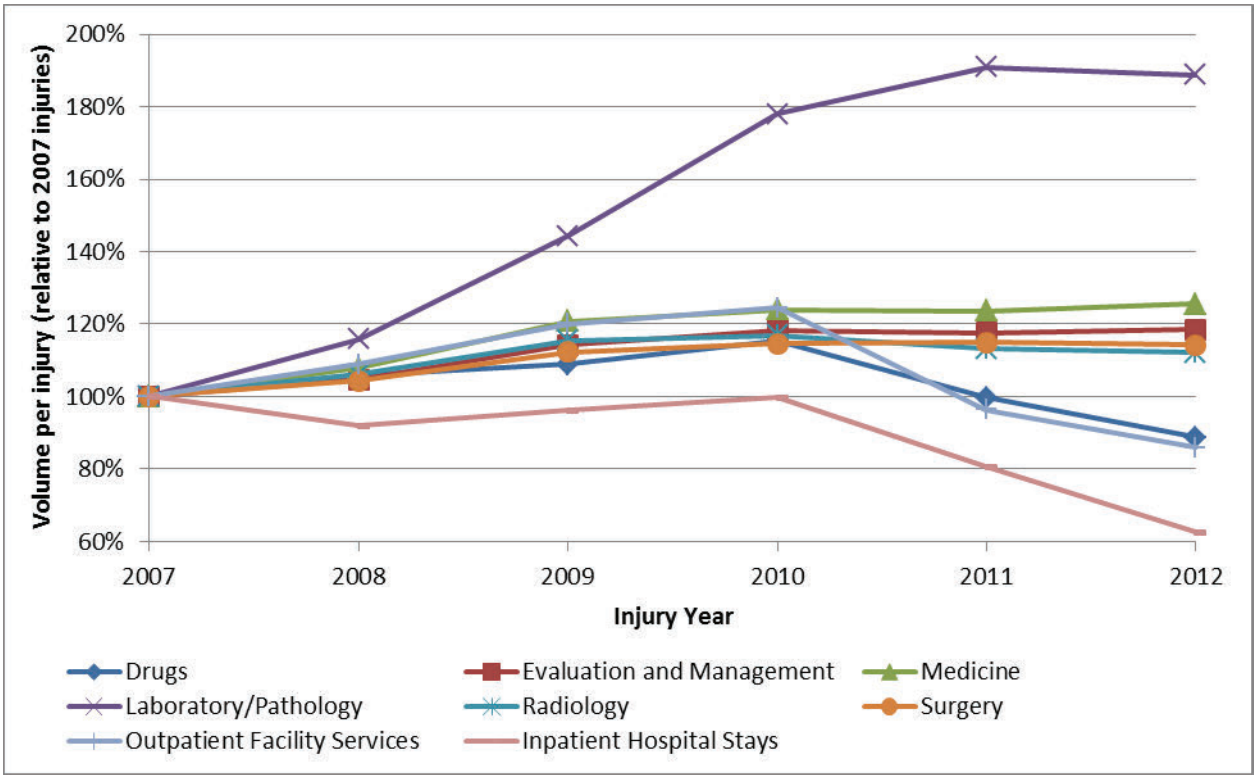
Results

The following sections report monitoring results related to utilization, spending, and return to work. Each section includes key summary figures and tables. Any claim counts provided in the results pertain to the claims reported in the WCIS medical data and received at least one medical service within six months of date of injury, which are substantially lower than the number of total compensable claims (Table 2.4).

Utilization

We found that utilization measured in volume of services per injury during the first 12 months following the date of injury increased over time for most nonfacility service categories, relative to utilization rates for 2007 injuries. Utilization of laboratory and pathology services in particular increased, with injuries in 2010, 2011, and 2012 experiencing 78, 91, and 89 percent higher utilization, respectively, compared with 2007 injuries (Figure 4.1). Other professional service categories—such as medical services, E&M services, surgical services, and radiology services—experienced more modest utilization increases in the range of 14–25 percent for injuries in 2012 compared with injuries in 2007. Utilization rates for drugs and outpatient facility services initially rose but subsequently fell for injuries occurring in 2011 and 2012 below the rates for 2007 injuries.

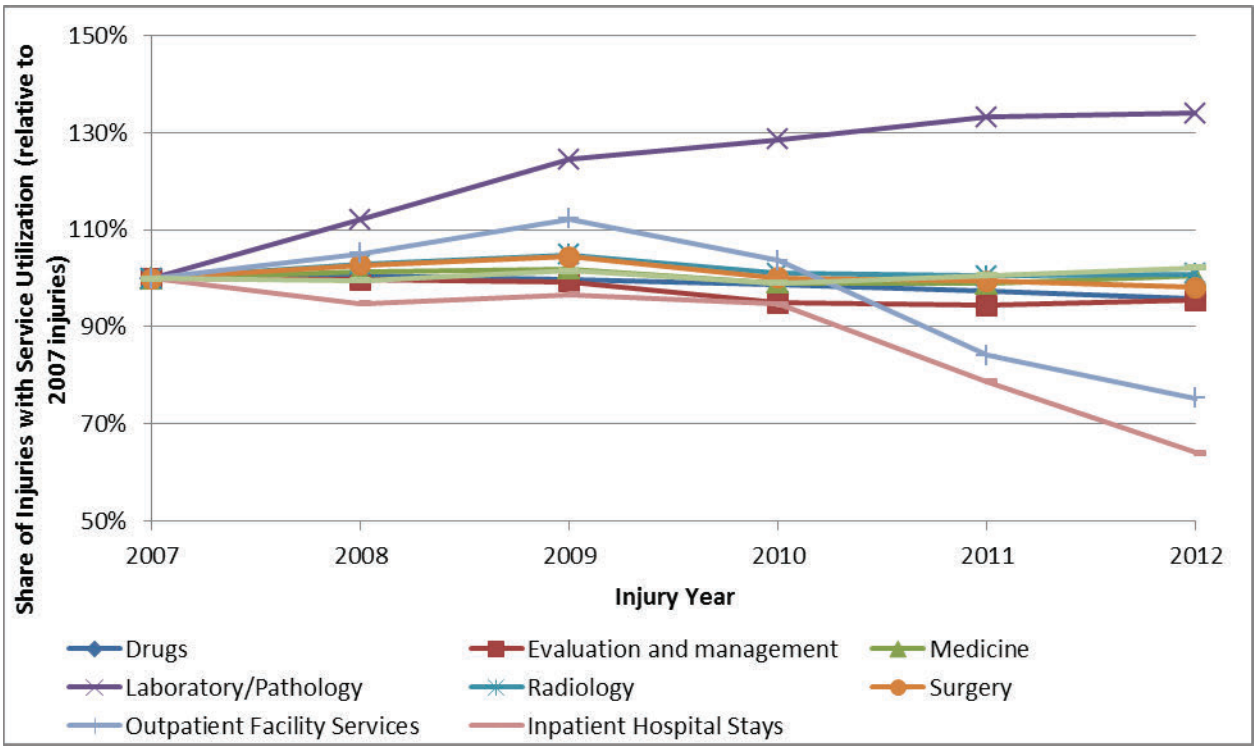
Figure 4.1. Per-Claim Service Volume Within 12 Months of Injury, by Service Category and Injury Year



Utilization of inpatient services also declined, with 12-month rates for 2012 injuries nearly 40 percent below those for 2007 injuries.[2]

Utilization measured in service per injury combines two separate trends: first, the likelihood that an injury will involve any utilization in a specific service category at all; and second, volume conditional on use.[3] Several utilization trends are driven by changes in the proportion of injuries with any use in the service category. Figure 4.2 presents the share of claims with at least one bill line in each category by injury year relative to injuries in 2007. About 34 percent more injuries in 2012 have at least one laboratory and pathology service in the first 12 months postinjury compared with injuries in 2007. Fewer 2012 claims have any inpatient or outpatient facility services compared with 2007 claims. The use of every other service category by injuries in 2012 is within –1 to 4 percent of 2007 user rates.

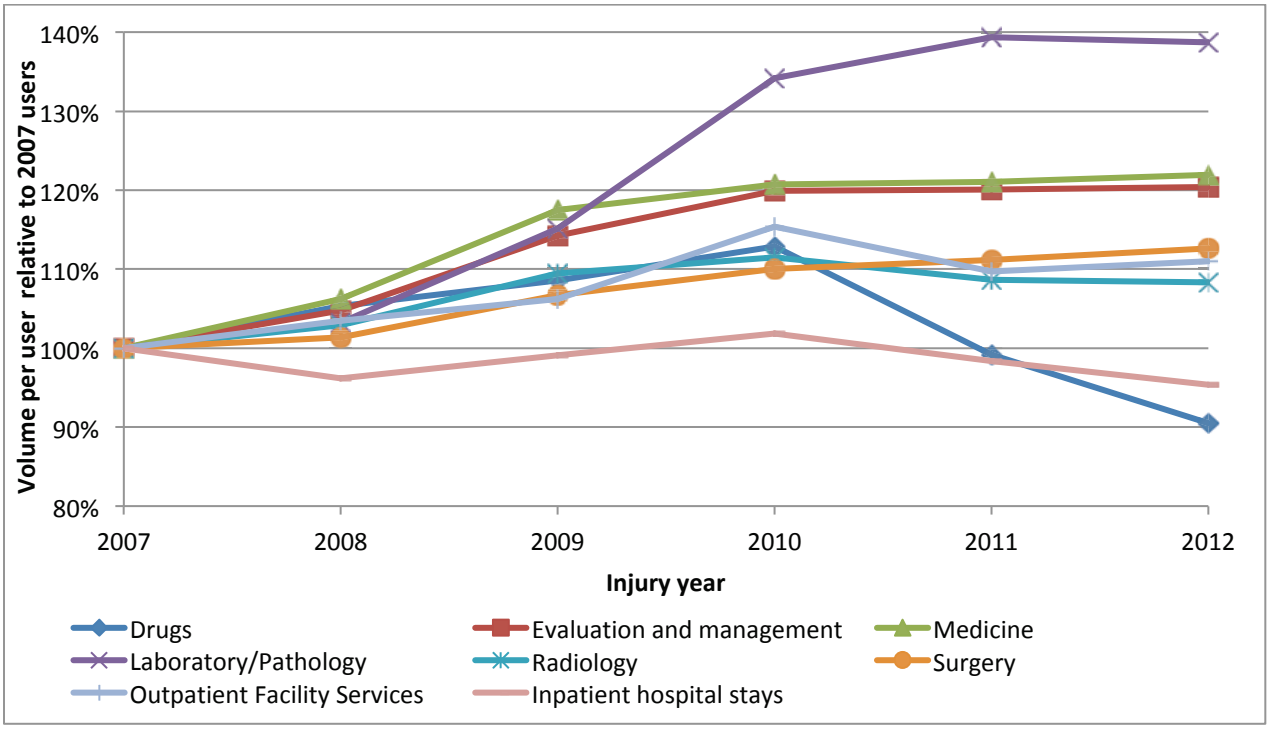
Figure 4.2. Share of Claims Using Different Types of Services Within 12 Months of Injury, by Injury Year Relative to Injury Year 2007



[2] The cause for the decline in 12-month utilization rates for outpatient surgery and inpatient hospitalizations between 2010 and 2012 is not clear. In particular, the rate for surgeries over this period remained constant. The 24-month inpatient and outpatient facility utilization rates for injuries occurring in 2010 are slightly higher than the levels for injuries occurring in 2007. This may be a data reporting issue.

[3] The data points in Figure 4.1 are the product of these two separate rates.

Figure 4.3. Per-Claim Utilization Within 12 Months of Injury, by Service Category and Injury Year, Conditional on Utilization in Category



Per-user utilization rates are conditional on an injury involving services in specific categories. Per-user utilization for laboratory and pathology services has increased dramatically—by 38 percent for injuries in 2012 compared with injuries in 2007—while utilization for drugs fell 10 percent and for inpatient hospital services by 5 percent. For all other categories, utilization rates per user increased by 11–21 percent for injuries in 2012 compared with injuries in 2007 (Figure 4.3).

Many of the tables and figures in the following sections where we compare trends for different subsets of claims reinforce two main points from Figures 4.2 and 4.3. First, the utilization of laboratory and pathology services increased dramatically from 2007 to 2012. Second, use of other service categories—for example, inpatient hospital stays, outpatient facility services, and drugs—has decreased over time on a per-claim basis.

Type of Injury

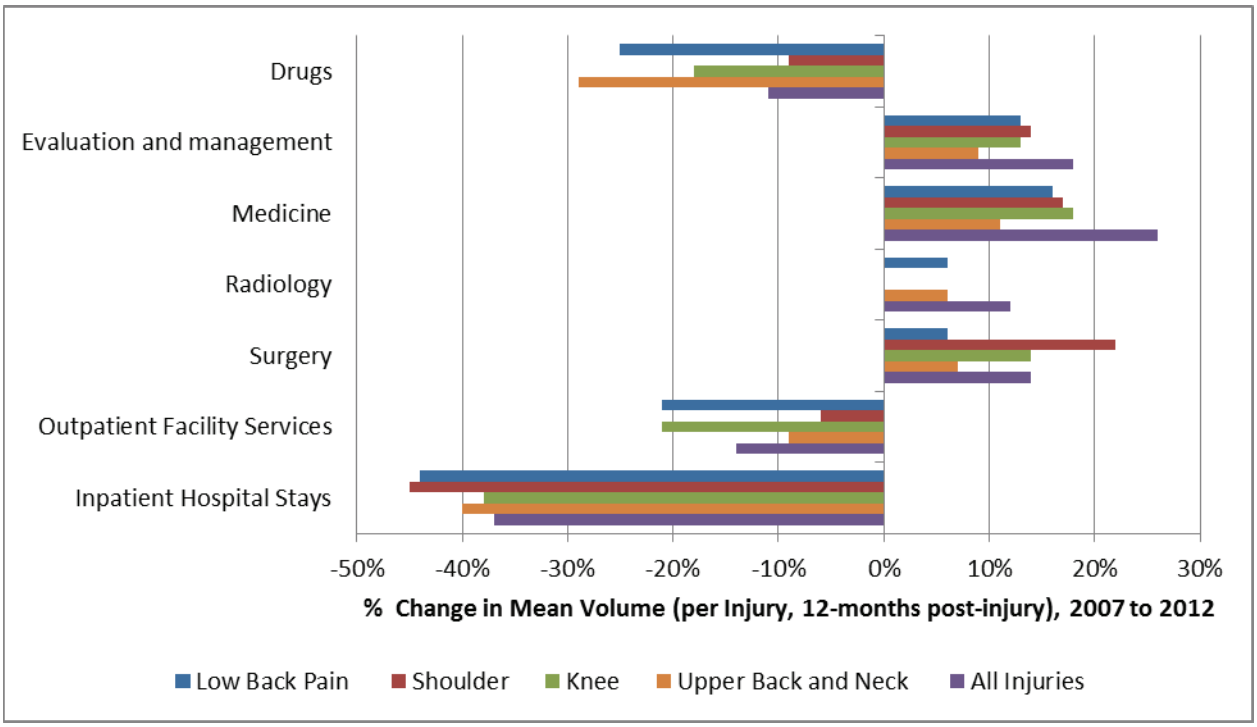
The proportion of WCIS claims for the four types of injuries that we tracked over time—lower back pain, upper back/neck, shoulder, and knees—increased by about 5.9 percentage points, or by about 21 percent, from 2007 to 2012 (Table 4.1). We found differences in per-claim utilization of health care services from 2007 to 2012 across the different types of injuries

Table 4.1. Change in Share of Injuries by Type of Injury, 2007–2012

Type of Injury	Injury Year 2007	2008	2009	2010	2011	2012	Change in Share (percentage points), 2007–2012
All injuries	472,723	428,676	369,361	295,780	283,090	299,609	–
Low back pain	16.2%	19.7%	17.5%	18.1%	18.0%	18.2%	2.0
Upper back and neck injuries	2.5%	2.7%	3.0%	3.4%	3.4%	3.3%	0.8
Shoulder injuries	5.7%	6.1%	6.6%	7.3%	7.4%	7.8%	2.1
Knee injuries	3.7%	4.1%	4.3%	4.5%	4.6%	3.4%	1.0
All other categories	71.9%	67.4%	68.6%	66.8%	66.7%	66.1%	–5.9

(Figure 4.4). Per-claim drug utilization, outpatient facility service utilization, and inpatient hospital stays decreased for the four specific conditions and for all claims combined. Lower back and upper back injuries had the largest growth in per-claim laboratory/pathology utilization (141 and 137 percent, respectively), compared with an 89-percent increase across all injuries and below-average increases for knee and shoulder injuries (see Figure 4.4 footnote).

Figure 4.4. Change in Volume per Claim, 2007–2012, by Type of Service and Type of Injury



NOTE: Laboratory/pathology changes are not shown but are as follows: 141 percent for low back pain, 80 percent for shoulder injuries, 62 percent for knee injuries, 137 percent for upper back and neck injuries, and 89 percent for all injuries.

Type of Payer

Between 70 and 80 percent of claims across injury years are submitted to WCIS for insured claims—the remainder is for claims from the State of California and self-insured public and private entities. The WCIS medical data had a larger proportion of claims from insured employers in 2012 compared with 2007 (Table 4.2; 72.9 versus 76.2 percent, $p < .001$).[4] We observed different magnitudes—and sometimes different directions—of utilization changes over time depending on whether claims were submitted by self-insured entities (including the State of California). Figure 4.5 illustrates the 2007–2012 per-claim change in utilization by service categories. Increases in radiology and surgery volume were larger for self-insured compared with insured injuries. Inpatient hospital stay volume fell significantly for insured but not for self-insured injuries. Finally, outpatient facility utilization dropped significantly for insured claims but increased for self-insured claims. The substantial differences in payer experience for inpatient and outpatient facility services may be indicative of data reporting issues for insured claims.

Table 4.2. Injuries by Injury Year and Type of Payer, 2007–2012

Self-Insured Category	Injury Year 2007	2008	2009	2010	2011	2012	Share of Total Injuries in 2012 (%)	Percentage-Point Change, 2007–2012,[a] in Share of Injuries
Insured	344,558	294,780	251,807	214,477	208,381	228,440	76.2	3.4
Self-insured	119,567	115,528	108,688	70,380	65,164	63,736	21.3	-4.0
Status missing	8,598	18,368	8,866	10,923	9,545	7,433	2.5	0.7
All injuries	472,723	428,676	369,361	295,780	283,090	299,609		

[a] All 2007–2012 differences are statistically significant with $p < .001$.

Geography

The number of California WC claims in the WCIS medical data decreased over injury years 2007–2012 at about the same rate—roughly 37 percent—statewide and in the northern and southern regions. While some of the more granular regions experienced smaller or larger changes in the number of claims reported in the WCIS medical data, the distribution of claims by area remained fairly stable (Figure 4.6). No region had more than a 1-percentage-point change in its share of claims.

[4] Insurers have higher compliance rates in reporting WCIS medical data. In 2007, insured claims accounted for 67 percent of new claims reported to the WCIS compared with 73 percent of the claims for which medical data were reported for injury year 2007. Insured medical data for injury year 2012 increased as a proportion of total medical data (76.0 percent), while the insured share of new claims for that year declined to 65.8 percent.

Figure 4.5. 2007–2012 Change in Volume per Claim 12 Months Postinjury by Service Category and Type of Payer

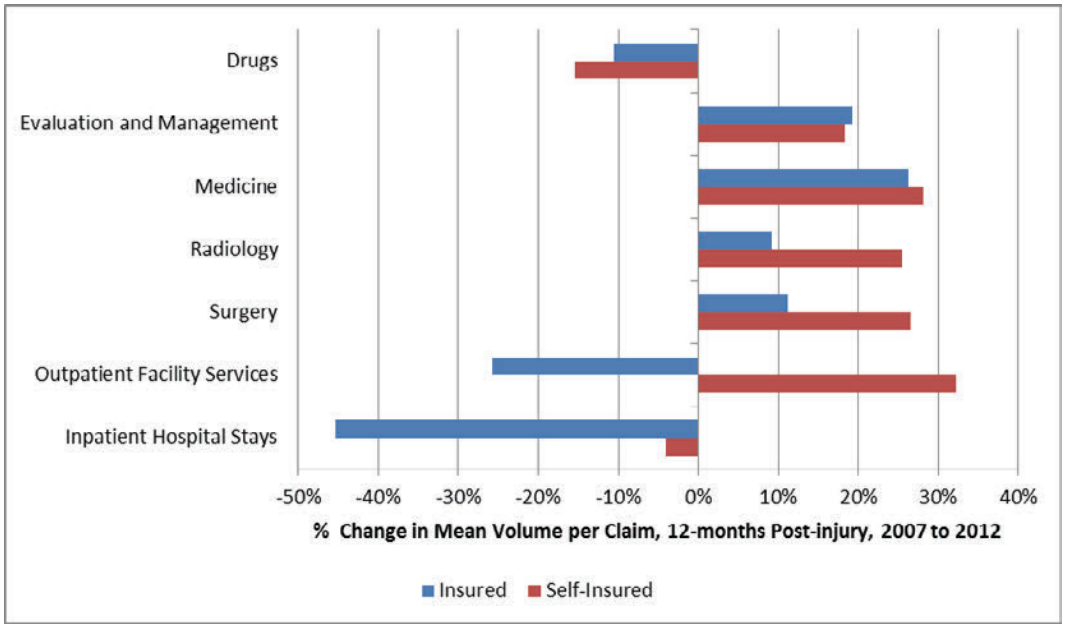
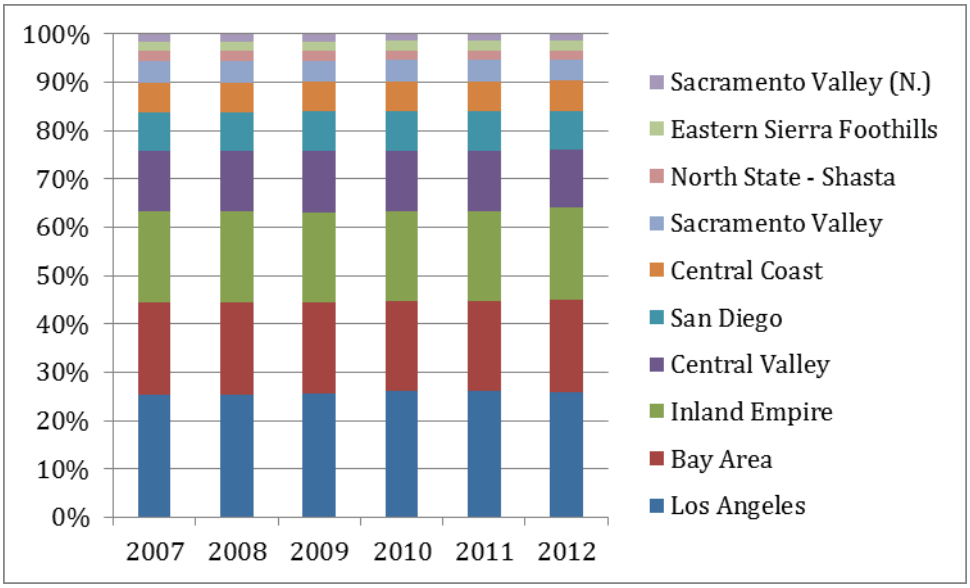


Figure 4.6. Distribution of New Claims by Region, 2007–2012 Injury Years



Trends in regions with large numbers of WC claims—the Los Angeles, Bay Area, Inland Empire, Central Valley, and San Diego regions—can drive the statewide trend. Table 4.3 reports changes in average per-injury utilization in different service categories within the first 12 months after injury in different California regions. Reading across rows in Table 4.3 can identify differences across regions. For example, in the drug service category, average utilization in the first 12 months after injury increased by 10 percent in San Diego and decreased by 19 percent in Los Angeles. Average utilization of laboratory/pathology services increased by 115 percent in the Inland Empire region compared with 52 percent in the Central Coast region.

Tracking Claim Status over Time

We tracked how quickly claims closed over time across injury years. Figure 4.7 reports the percentage of claims closed within three months, between three and six months, and so on, reporting as much information as is available in our WCIS data. The proportion of claims closed within three months decreased from a high of 56.2 percent for 2008 injuries to 52.0 percent for 2012 injuries. Some of this volume of claims shifted to the categories of 3–6, 6–12, and 12–18 months for 2011 and 2012 injuries. Fewer than 10 percent of claims in each injury year where we can track claims for more than 36 months are open after 36 months.

Spending

Per-claim spending within 12 months of injury increased from $1,994 for 2007 injuries to $2,463 for 2012 injuries, or by 24 percent (Figure 4.8). Total spending per claim in the first 12 months peaked for 2010 injuries at $2,590 and decreased slightly for 2011 and 2012 injuries. Different service lines experienced different spending growth trends (Figure 4.9). Per-claim spending within 12 months of injury on both inpatient hospital stays and outpatient (hospital and ASC) facility services increased significantly from 2007 through 2010 injuries but decreased for 2011 and 2012 injuries. The net increase in per-claim spending from 2007 to 2012 injuries was 13 percent and 15 percent for inpatient and outpatient facility services, respectively. Other service categories—such as drugs, medicine, radiology, E&M, and surgery—increased more slowly but steadily from 2007 to 2012 injuries, with net increases between 15 and 32 percent. The last category—laboratory and pathology services—increased rapidly from 2007 through 2011 and at much higher rates than other service categories. Per-claim spending within 12 months of injury on laboratory and pathology services was 4.96 times higher for 2012 injuries than for 2007 injuries.

Table 4.3. Percentage Change in Average Volume per Claim Within 12 Months of Injury, 2007–2012, by Region and Service Category

	Total	Bay Area	Central Coast	Central Valley	Eastern Sierra Foothills	Inland Empire	Los Angeles	North State–Shasta	Sacramento Valley	Sacramento Valley (N.)	San Diego
Drugs	–11	–1	–21	–13	3	–10	–19	–24	–5	–26	10
E&M	18	17	16	21	29	23	17	19	28	23	17
Medicine	26	26	24	35	47	26	20	23	47	37	32
Laboratory/ Pathology	89	83	52	104	85	115	88	59	69	108	108
Radiology	12	19	2	17	25	16	8	–5	21	7	14
Surgery	14	9	12	21	34	18	14	15	14	9	10
Outpatient Facility Services	–14	–6	–17	–2	–5	–11	–22	–11	5	–12	–30
Inpatient Hospital Stays	–37	–44	–51	–33	–3	–36	–39	–34	–13	–13	–38

Figure 4.7. Percentage of Claims Closed at Different Periods After Injury, by Injury Year

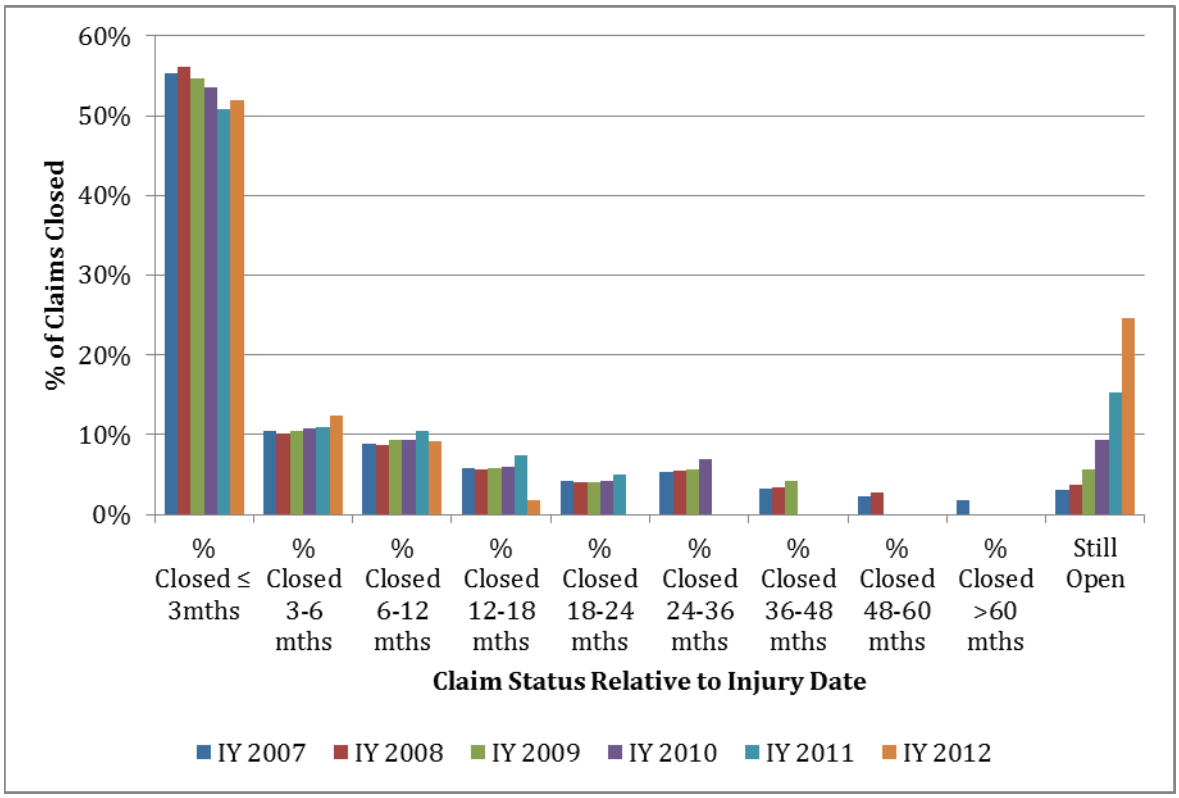


Figure 4.8. Average Per-Claim Total Spending Within 12 Months of Injury

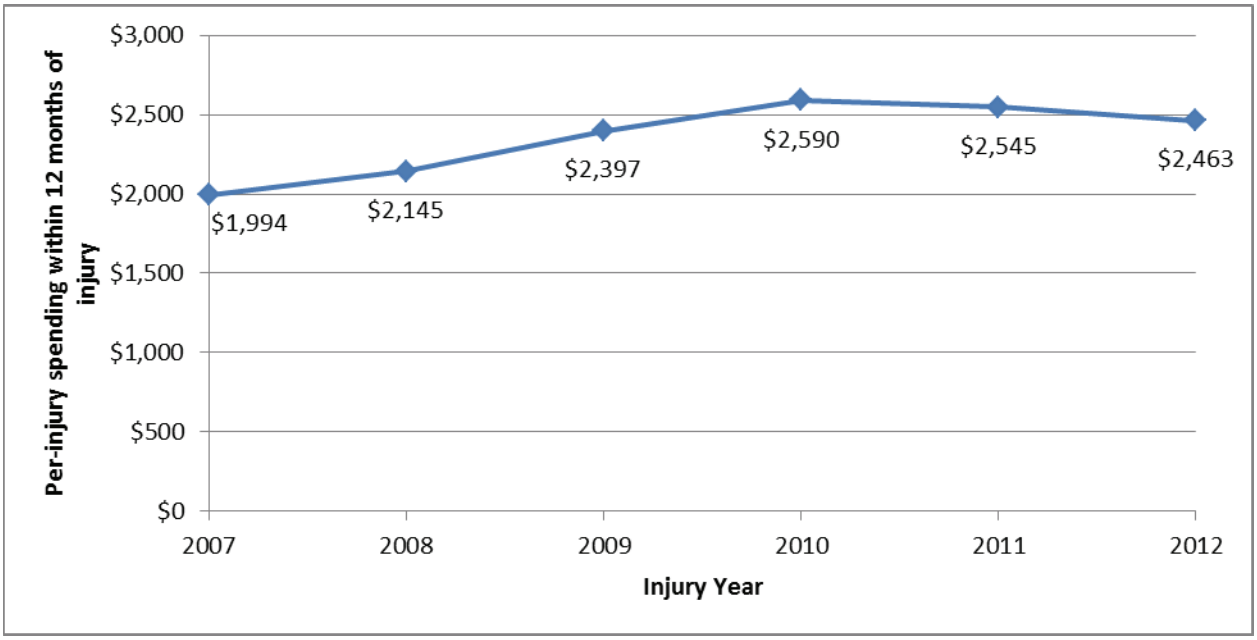
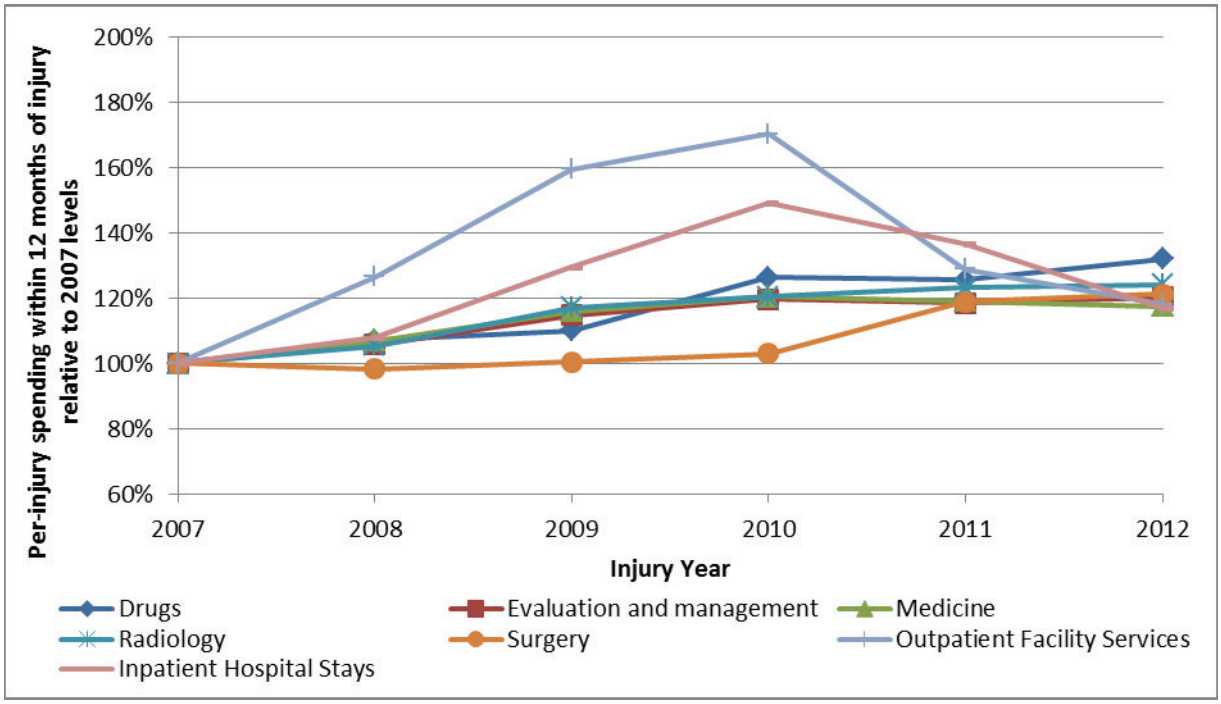


Figure 4.9. Average Total Spending per Claim Within 12 Months of Injury Relative to 2007 Levels, by Service Category



NOTE: Spending levels relative to 2007 levels for laboratory/pathology services not reported. They were 116% for 2008, 183% for 2009, 315% for 2010, 483% for 2011, and 496% for 2012.

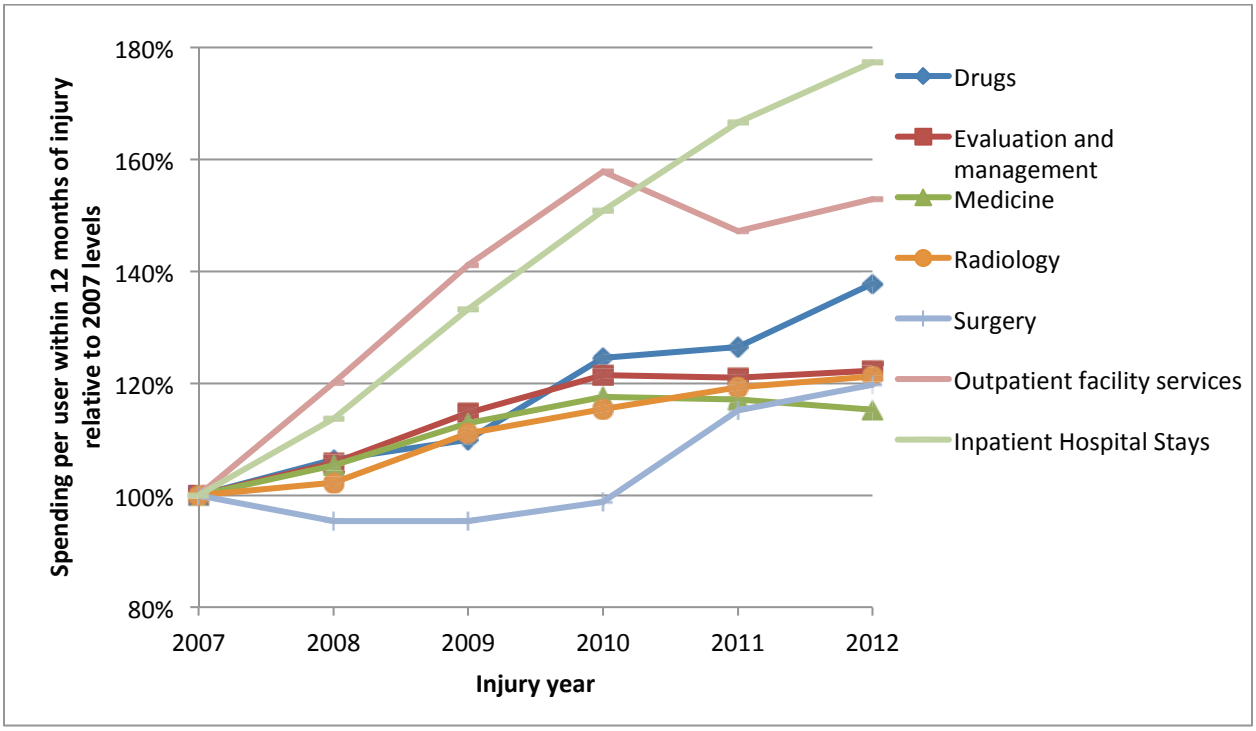
The dramatic increase in spending for laboratory and pathology services was not only due to more injured workers receiving these services but an increase in the spending per user. Spending per user for laboratory and pathology services in 2012 was 3.7 times the 2007 spending levels. The increases in per user spending for inpatient and outpatient facility stays were also higher than the increases for other services (Figure 4.10). At the same time that per-claim spending for these services was increasing, the proportion of injured workers receiving hospital outpatient and/or inpatient services decreased significantly.

Below, we provide further analysis of the spending increases for the five types of services with the highest increases in conditional spending per claim: laboratory/pathology, inpatient and outpatient facility services, surgery, and outpatient drugs.

Laboratory/Pathology Services

Spending increases for laboratory/pathology services from 2007 to 2012 were dramatic. Payments for laboratory tests grew from 0.4 percent of total medical service spending in the first 12 months for injury year 2007 to 1.4 percent for injury year 2012—in other words, a significant increase over a small base. Average spending per claim for laboratory services in the first 12 months grew from $8.48 for injury year 2007 to $41.51 for injury year 2012. Because most services were subject to the OMFS, the growth is largely attributable to increases in the proportion of injured workers with laboratory services during the first 12 months following

Figure 4.10. Average Spending per User Within First 12 Months of Injury Relative to 2007 Levels, by Service Category, Conditional on Spending in Each Category



NOTE: Per user spending levels for laboratory/pathology services relative to 2007 were 104 percent in 2008, 147 percent in 2009, 245 percent in 2010, 362 percent in 2011, and 371 percent in 2012.

injury, an increase in the number of laboratory services they received, or a change in the mix of services rather than changes in fees.

When we examined laboratory/pathology services by CPT classifications, we found that seven categories of tests accounted for 94 percent of all spending for laboratory/pathology tests within the first 12 months for injury year 2007 (Table 4.4). Growth in two categories—chemistry

Table 4.4. Per-Claim Spending for Laboratory/Pathology Services by Service Classification, 2007–2012

Type of Test	2007 Per Claim ($)	2008 Per Claim ($)	2009 Per Claim ($)	2010 Per Claim ($)	2011 Per Claim ($)	2012 Per Claim ($)	Percentage Increase in Spending		
							Total	Per Claim	Per User
Chemistry	1.63	1.95	3.12	9.46	23.80	24.90	860	1432	998
Immunology	1.56	1.81	2.06	2.08	2.03	1.99	–20	27	28
Panel	1.43	1.53	1.67	1.82	1.90	1.80	–21	25	18
Hematology	1.36	1.45	1.64	1.73	1.65	1.59	–27	17	17
Surgical Pathology	1.14	1.15	1.26	1.26	1.19	1.09	–40	–4	33
Microbiology	0.63	0.70	0.77	0.78	0.74	1.23	22	95	91
Drug Testing	0.39	0.91	4.28	8.90	8.60	6.04	879	1462	1383
Urinalysis	0.27	0.29	0.31	0.37	0.41	0.39	–10	44	21

tests and drug testing—fueled the spending increases and is associated with the increased use of opioids. The drug testing codes are used to test for the presence or absence of one or more drugs in the patient's system (typically a urine screen) and identify potential noncompliance and drug diversion. A chemistry test is used if quantification of the amount of drugs is needed. Within the chemistry codes, those used for drug testing accounted for the increases.

Inpatient and Outpatient Facility Services

The steep decline in the average number of hospital stays and outpatient facility services within 12 months of injury (Figure 4.2) suggests there may be data reporting issues for 2011 and 2012 injuries.[5] For those injured workers who were reported as requiring inpatient hospital services within 12 months of injury, spending increased 77 percent (Figure 4.10). There are several likely reasons for this increase in addition to price inflation. First, with a shift of services from inpatient to outpatient settings, patients who were hospitalized in 2012 were likely to be sicker and more costly than those who were hospitalized in 2007. Second, most inpatient hospitalizations are for spinal surgery. The hardware implanted during spinal surgery was reimbursed on a cost basis during this period and was not subject to the same constraints as services subject to the OMFS. Finally, changes to the inpatient fee schedule beyond the change in the OMFS conversion factor may have contributed to the increase.

To the extent surgical services shifted from inpatient to outpatient facility settings, we would expect to see an increase in both utilization and spending for outpatient ambulatory surgery facility services. Per-claim utilization rates for ambulatory surgery facility services steadily increased for the first 12 months postinjury for injury years 2007–2010 but declined for injury years 2011 and 2012 (Table 4.5), again suggesting that there may be data reporting issues. For injury year 2012, the per-claim service volume was 5 percent lower than for injury year 2007, but the volume per user was 6 percent higher. Spending per user for injury year 2012 was 38 percent higher than for injury year 2007. In contrast, the price index for hospital outpatient services increased 13 percent (Table 3.4), suggesting that not only were more services furnished per user during the first 12 months postinjury but they were more resource-intensive.

[5] The California Office of Statewide Health Planning and Development tracks inpatient hospital utilization by payer. Total WC acute care hospital discharges in 2012 were 17 percent below 2007 levels. This decrease, which reflects both reductions in the number of WC claims as well as reduced admission rates, supports our concern that hospital stays may be underreported in the WCIS data.

Table 4.5. Average Service Volume and Spending for Ambulatory Surgery and Emergency Department Services per Claim and per User, 12 Months Postinjury for Injury Years 2007–2012

	2007	2008	2009	2010	2011	2012	Percentage Change 2007–2012
Ambulatory Surgery							
Per-claim volume	0.15	0.18	0.20	0.20	0.16	0.15	–5
Per-user volume (conditional)	1.86	1.91	1.97	2.10	1.94	1.96	7
Per-claim spending	$135	$175	$221	$228	$171	$160	22
Per-user spending (conditional)	$1,613	$1,898	$2,188	$2,390	$2,201	$2,221	38
Emergency Department							
Per-claim volume	0.14	0.14	0.15	0.15	0.13	0.11	–24
Per-user volume (conditional)	1.17	1.16	1.16	1.22	1.19	1.20	2
Per-claim spending	$22	$24	$27	$30	$24	$21	–5
Per-user spending (conditional)	$180	$188	$206	$228	$228	$230	28

NOTE: Spending includes payments to facilities only. Related professional services are not included. Conditional volume and spending are calculated across claims with at least one paid bill of these types rather than all claims.

Per-claim use of emergency services also increased for injury years 2008–2010 but declined during the first 12 months postinjury for injury years 2011 and 2012 (Table 4.5). For injury year 2012, per-claim spending was 5 percent lower than for injury year 2007, but per-user spending was 28 percent higher. Most of the increase is accounted for by the increase in per-user volume (2 percent) and price inflation (13 percent).

Professional Surgical Services

In 2007, professional billings for surgical services were predominantly for musculoskeletal (58 percent) and spinal (12 percent) procedures. A mix of other types of procedures accounted for the remaining 30 percent of surgical procedures. Spinal procedure volume grew 19 percent from 2007 to 2012 compared with a 12 percent growth in musculoskeletal procedure volume (Table 4.6).[6] The increase in per-claim spending for both types of procedures was similar, but per-user spending increased 17 percent for musculoskeletal procedures and was flat for spinal procedures. The difference reflects an increase in per-user volume for musculoskeletal procedures compared with a slight decline for spinal procedures. The rates of growth in volume and spending were much lower for other types of surgical procedures.

[6] We define volume as the number of billed line items. The increases could result from increases in the number of surgical encounters and/or the number of procedures performed during a surgical encounter.

Table 4.6. Average Service Volume and Spending for Professional Surgical Services per Claim and per User, 12 Months Postinjury for Injury Years 2007–2012

	2007	2008	2009	2010	2011	2012	Percentage Change 2007–2012
Musculoskeletal							
Per-claim volume	0.40	0.43	0.46	0.46	0.46	0.46	16
Per-user volume	2.26	2.28	2.36	2.43	2.45	2.45	9
Per-claim spending	$138	$137	$139	$140	$166	$172	24
Per-user spending	$782	$730	$707	$732	$879	$912	17
Spine and Spinal Cord							
Per-claim volume	0.08	0.08	0.09	0.09	0.10	0.10	23
Per-user volume	2.31	2.25	2.26	2.27	2.33	2.28	–1
Per-claim spending	$28	$28	$30	$32	$38	$35	25
Per-user spending	$813	$752	$756	$767	$848	$817	0
Other Procedures							
Per-claim volume	0.21	0.20	0.21	0.22	0.22	0.22	7
Per-user volume	1.49	1.48	1.54	1.58	1.54	1.57	6
Per-claim spending	$33	$31	$31	$32	$33	$34	4
Per-user spending	$237	$224	$221	$229	$233	$245	3

Outpatient Drugs

About 60 percent of injured workers received one or more outpatient drugs during the first 12 months following injuries occurring in 2007 through 2012. The percentage was similar across injury years. The number of drug lines per user peaked at 7.6 in injury year 2010 and declined to 6.1 in injury year 2012 (Figure 4.11). Despite the 10 percent decline in drug volume per user from 2007 to 2012, spending per user increased 38 percent from $243 in injury year 2007 to $335 in injury year 2012. The increases in spending per user reflect a marked increase in average spending per prescription line beginning in injury year 2010 (Figure 4.12).

Analgesics/antipyretics accounted for 59 percent of total outpatient drug prescriptions within 12 months postinjury in injury year 2012. Within this broad therapeutic class, nonsteroidal anti-inflammatory drugs (NSAIDs) accounted for 31 percent of all drug lines and opioids accounted for 24 percent (Figure 4.13). Relative to all WC claims in a given service year, the proportion of prescriptions for NSAIDs during the first 12 months postinjury is higher and the proportion for opioids is lower. Another RAND study found that 26 percent of outpatient prescriptions dispensed to all injured workers in 2013 were for opioids compared to 19 percent for NSAIDs (Wynn et al., 2016).

The proportion of drugs in most therapeutic classes was relatively stable over 2007–2012. There were larger changes in the percentage of total outpatient drug payments accounted for by

Figure 4.11. Outpatient Drug Volume and Spending per User, 12 Months Postinjury for Injury Years 2007–2012

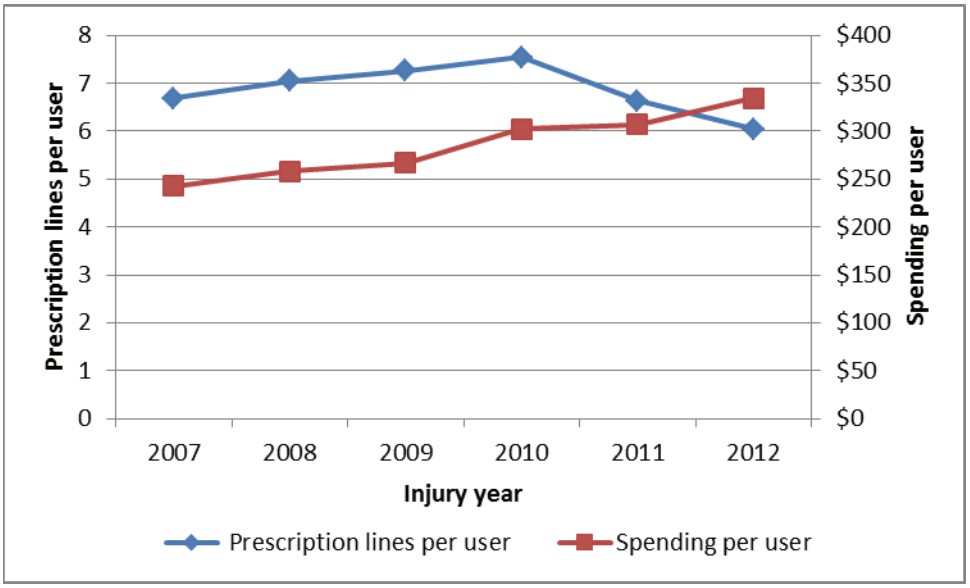
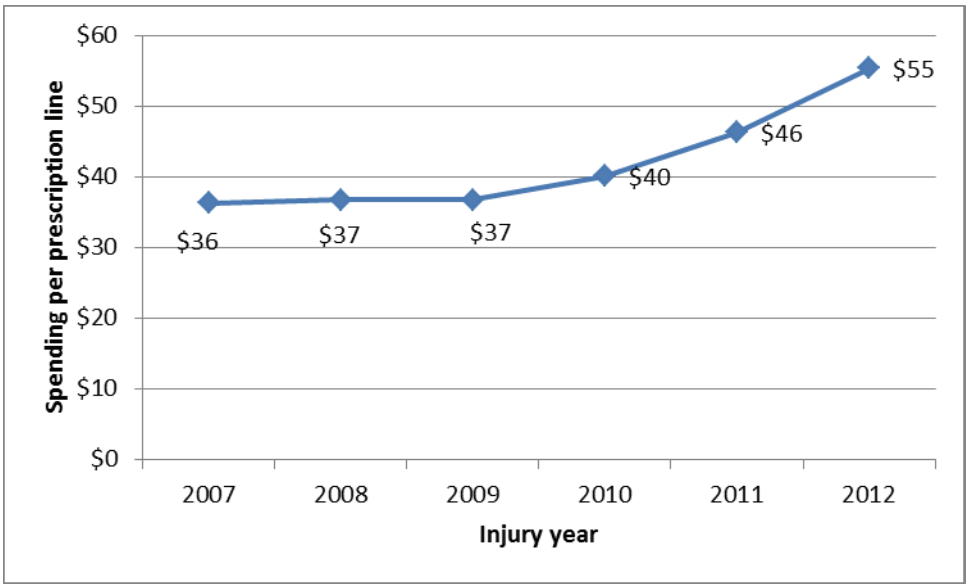
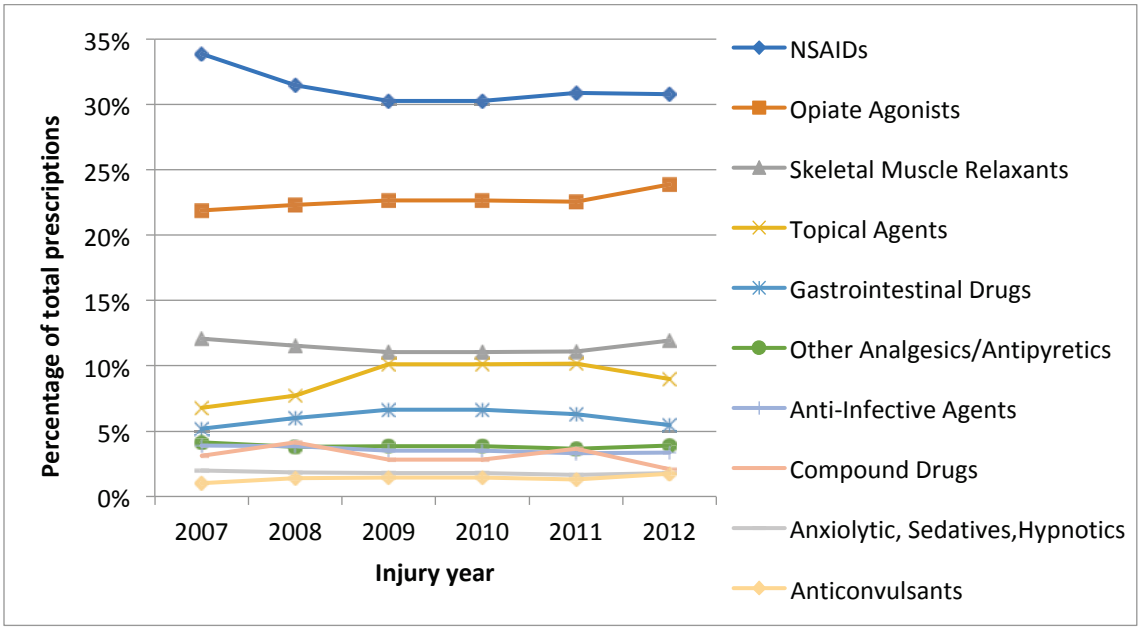


Figure 4.12. Spending per Prescription Drug Line, 12 Months Postinjury for Injury Years 2007–2012



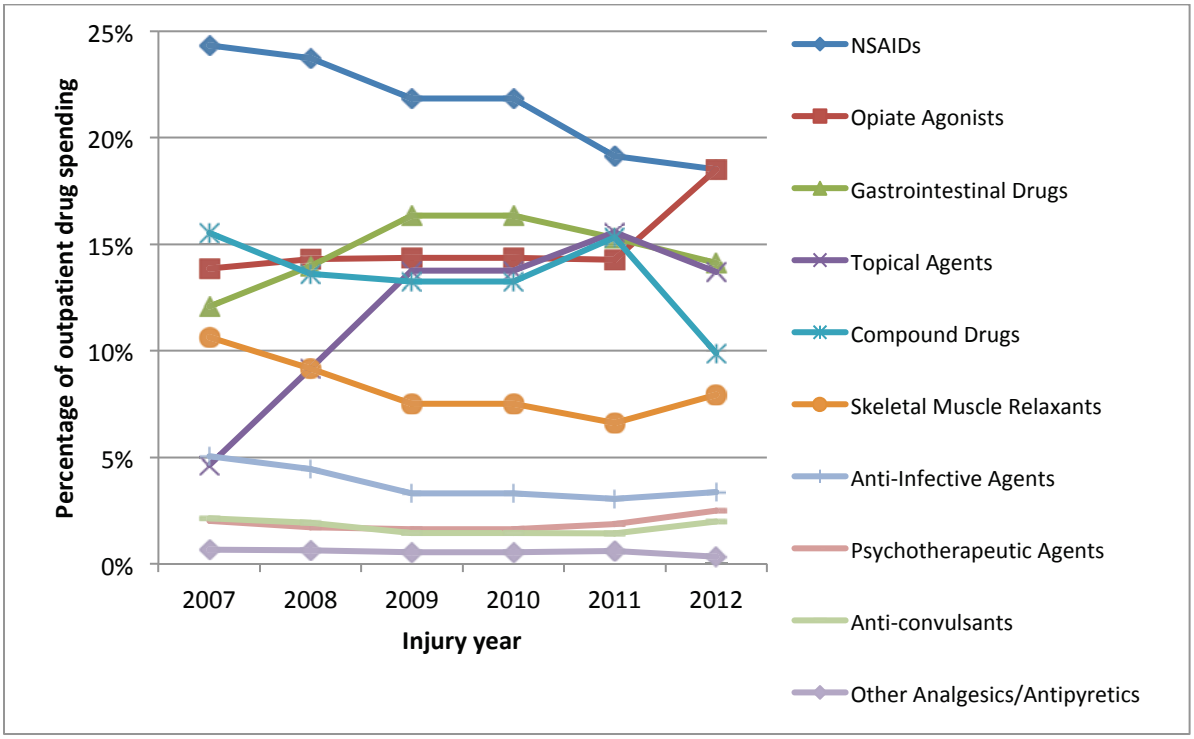
therapeutic classes with the highest aggregate payments for drugs (Figure 4.14). The percentage of total payments attributable to NSAIDs decreased from 24 percent in 2007 to 19 percent in 2012 while the percentage for opioids increased from 14 percent to 19 percent over the same period. Payments for topical agents (mostly anesthetic/analgesic creams and ointments) increased while payments for compounded drugs, much of which was also for topical creams and ointments, decreased.

Figure 4.13. Drug Therapeutic Classes with Highest Volume During First 12 Months Postinjury, Injury Years 2007–2012



NOTE: Each drug line on WC bills is counted as a prescription, including for compound drugs with multiple lines.

Figure 4.14. Drug Therapeutic Classes with Highest Spending During First 12 Months Postinjury, Injury Years 2007–2012



On a per claim basis, the average number of prescriptions filled during the first 12 months following injury in each of the high-volume therapeutic classes increased in injury year 2012 relative to injury year 2007 (Table 4.7). For example, the average number of NSAID prescriptions increased 54 percent. The average payment per prescription also increased for most therapeutic classes. The average payment per prescription increased over 50 percent for opioids (72 percent), skeletal muscle relaxants (57 percent), topical agents (213 percent), and compound drugs (53 percent). For reference, we estimate the inflation increase in drug prices was 11.6 percent (Table 3.4). Increases in both the average number of prescriptions and the average payment per prescription resulted in substantial increases in average payments per claim in most therapeutic classes. In response to concerns over the increases in drug utilization and spending and the medical appropriateness of opioid and other drug therapies, Assembly Bill 1124 (Perea) requires that DWC implement a drug formulary. A RAND study undertaken for the Department of Industrial relations examining formulary implementation issues provides further discussion of the overall trends in drug utilization and spending over this period (Wynn et al., 2016).

Table 4.7. Change in Per-Claim Prescriptions, Payments per Prescription, and Payments per Claim during First 12 Months Postinjury, Injury Years 2007–2012

	2007 Outpatient Drug Usage			Percentage Change 2007–2012		
	Average number of prescriptions per claim	Average payment per prescription ($)	Average payment per claim ($)	Average number of prescriptions per claim (%)	Average payment per prescription (%)	Average payment per claim (%)
NSAIDs	1.13	25.01	28.31	54	18	82
Opiate agonists	0.73	22.06	16.13	85	72	220
Other analgesics/ antipyretics	0.14	6.43	0.89	68	7	79
Skeletal muscle relaxants	0.40	30.72	12.40	79	57	180
Topical agents	0.23	23.90	5.41	126	213	606
Gastrointestinal drugs	0.17	81.15	14.06	13	35	52
Anti-infective agents	0.13	45.32	5.90	46	9	60
Compound drugs	0.10	174.26	18.08	92	53	194
Anxiolytic, sedatives, hypnotics	0.07	50.02	3.29	187	–23	120
Psychotherapeutic agents	0.05	51.99	2.36	54	–41	–9
Glucocorticoids	0.04	15.07	0.58	55	30	101
Anticonvulsants	0.03	73.75	2.51	60	–34	5

NOTE: Each drug line on WC bills is counted as a prescription, including for compound drug prescriptions with multiple lines.

Type of Injury

Each of the four types of injuries that we separately analyzed had slower growth in per-claim spending than the average across all injury types, implying that some other injuries had higher

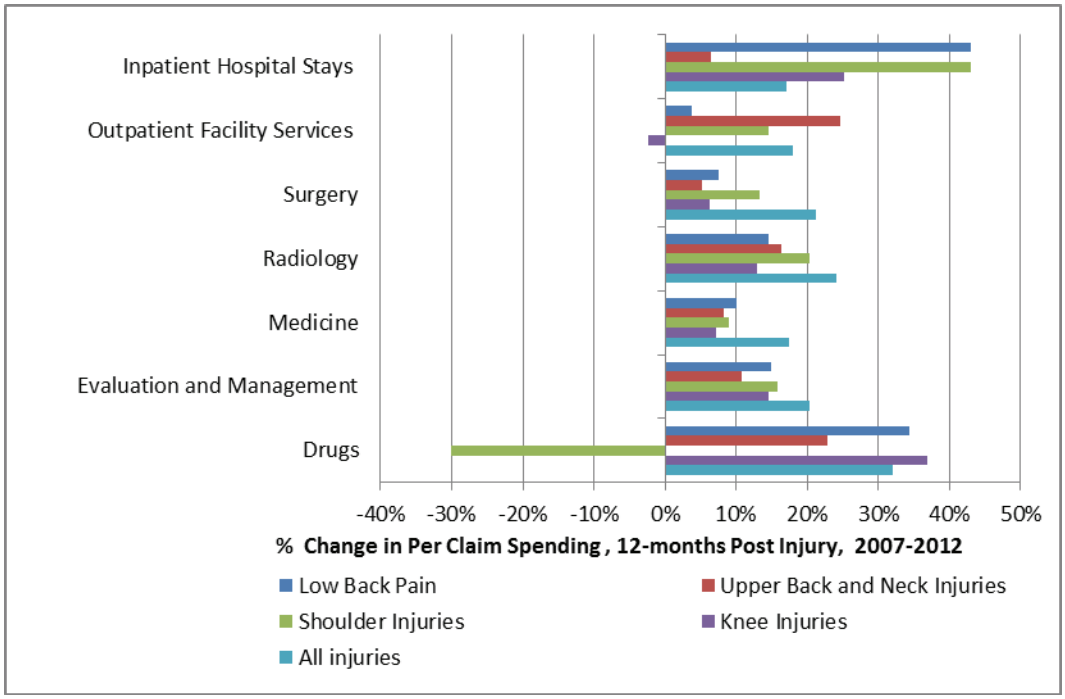
growth rates (Table 4.8). Of the four categories, lower back pain increased most rapidly with a 23 percent increase in per-claim spending within 12 months of injury from 2007 injuries to 2012 injuries. Shoulder injuries experienced less spending per claim for 2012 injuries compared with 2007 injuries. By type of service (Figure 4.15), lower back and upper back injuries had extremely large increases in per-claim spending on laboratory and pathology services at 842 and 794 percent, respectively, compared with an increase of 389 percent across all injuries. Per-claim drug spending for shoulder injuries fell by 30 percent from 2007 injuries to 2012 injuries.

Table 4.8. Per-Claim Spending During First 12 Months Postinjury by Type of Injury

	Injury Year						
Type of Injury Category	**2007 ($)**	**2008 ($)**	**2009 ($)**	**2010 ($)**	**2011 ($)**	**2012 ($)**	**Percentage change, 2007–2012[a]**
Low back pain	2,472	2,609	2,988	3,149	3,228	3,050	23
Upper back and neck injuries	2,231	2,309	2,572	2,747	2,727	2,581	16
Shoulder injuries	3,288	3,407	3,905	3,833	3,804	2,472	–25
Knee injuries	3,396	3,567	3,908	3,918	3,794	3,764	11
All injuries	1,994	2,145	2,397	2,590	2,545	2,463	24

[a] All 2007–2012 differences statistically significant with $p < .001$.

Figure 4.15. Change in Per-Claim Spending During First 12 Months Postinjury, by Type of Injury, Injury Years 2007–2012



NOTE: Percentage increases in per claim spending for laboratory/pathology are 789 percent for low back pain, 420 percent for shoulder injuries, 300 percent for knee injuries, 709 percent for upper back and neck injuries, and 389 percent for all injuries.

Payer Status

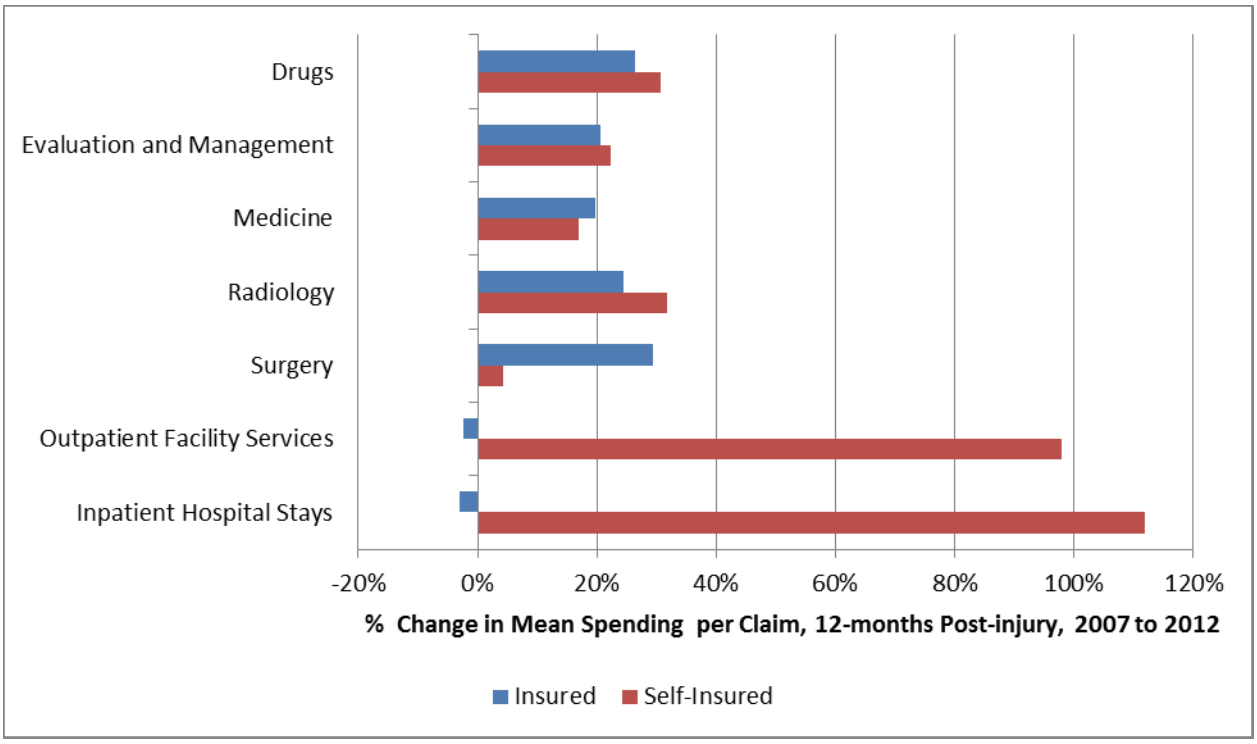
Per-claim spending within 12 months of injury grew more rapidly for injured workers at self-insured employers with a 35 percent increase between 2007 injuries and 2012 injuries compared with a 21 percent increase for workers at insured employers (Table 4.9). We found large differences in spending growth by service category (Figure 4.16). Insured injuries had the highest growth rate of spending for laboratory and pathology services with a 483 percent increase from 2007 injuries to 2012 injuries compared with a 174 percent increase for self-insured injuries (not shown). Insured injuries also had significant growth in spending for professional surgical services compared with self-insured injuries. Finally, self-insured injuries had nearly double the per-claim spending on outpatient facility services and inpatient hospital

Table 4.9. Per-Claim Spending During First 12 Months Postinjury by Payer Status

Self-Insured Category	Injury Year						Percentage Change, 2007–2012[a]
	2007 ($)	2008 ($)	2009 ($)	2010 ($)	2011 ($)	2012 ($)	
Insured	2,007	2,183	2,490	2,613	2,576	2,431	21
Self-insured	1,813	1,904	1,963	2,240	2,278	2,446	35
Total	1,994	2,145	2,397	2,590	2,545	2,463	24

[a] All 2007–2012 differences statistically significant with $p < .001$.

Figure 4.16. 2007–2012 Change in Per-Claim Spending During First 12 Months Postinjury by Payer Status



stays from 2007 to 2012 compared with a slight decrease in spending in these categories for insured injuries. The differential increases in these categories may be attributable to underreporting of facility services by insurers.

Geography

Because we assigned claims to a geographic area based on the zip code of the injured worker's residence, our spending measures relate to the services furnished to injured workers residing in each geographic area, some of which may have been furnished in a different geographic region. While every California region experienced an increase in per-claim spending within 12 months of injury from 2007 to 2012, the magnitude of the change varied across regions from a 21 percent increase in the North State–Shasta region to a 48 percent increase in the Eastern Sierra Foothills region (Figure 4.17). Regions with high claim volume—such as the Los Angeles, Central Valley, and Bay Area regions—were closer to the statewide average of 24 percent. Table 4.10 reports changes in spending for specific service categories across regions. Spending for drugs in the San Diego region increased by nearly double the statewide rate at 64 percent. There was considerable variation in the increase in average laboratory/pathology services across regions, ranging from a 67 percent increase in the North State–Shasta region to a 593 percent increase in the Inland Empire region. Changes in per-claim spending for outpatient facility services and inpatient hospital stays also varied significantly across regions, including large increases in regions such as the Eastern Sierra Foothills and much smaller increases in high-volume regions such as Los Angeles.

Figure 4.17. Change in Per-Claim Spending, by Region, Injury Years 2007–2012

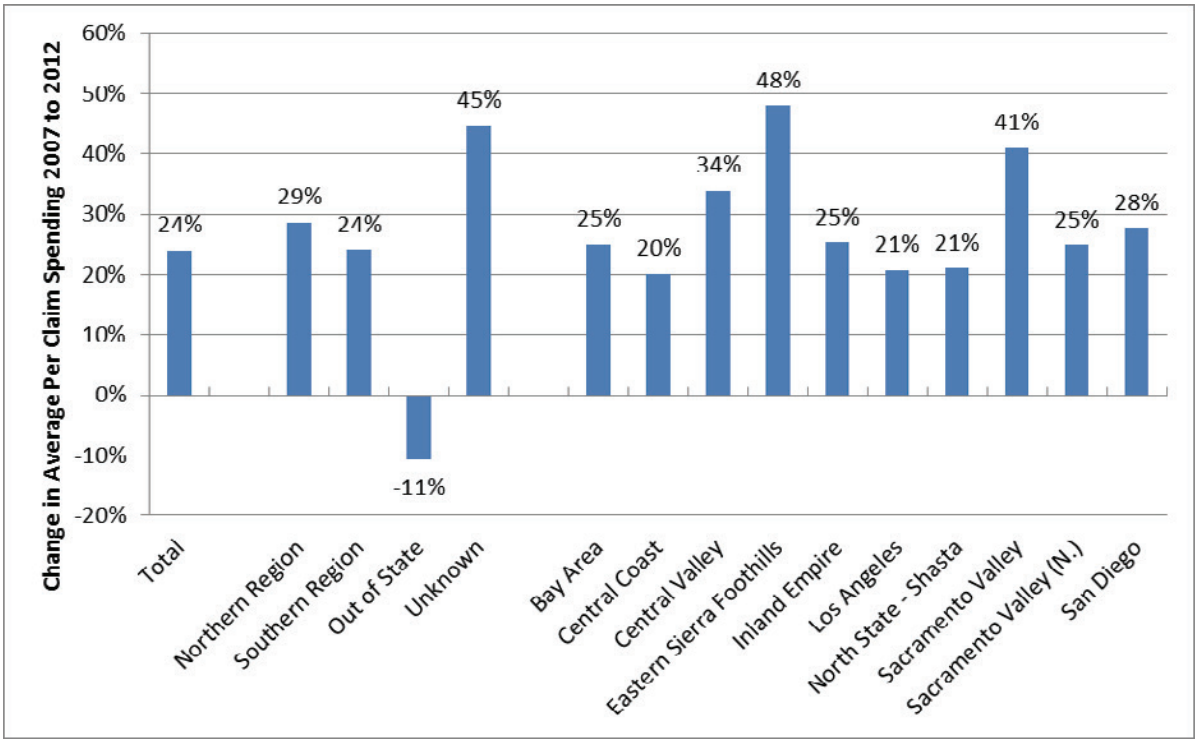


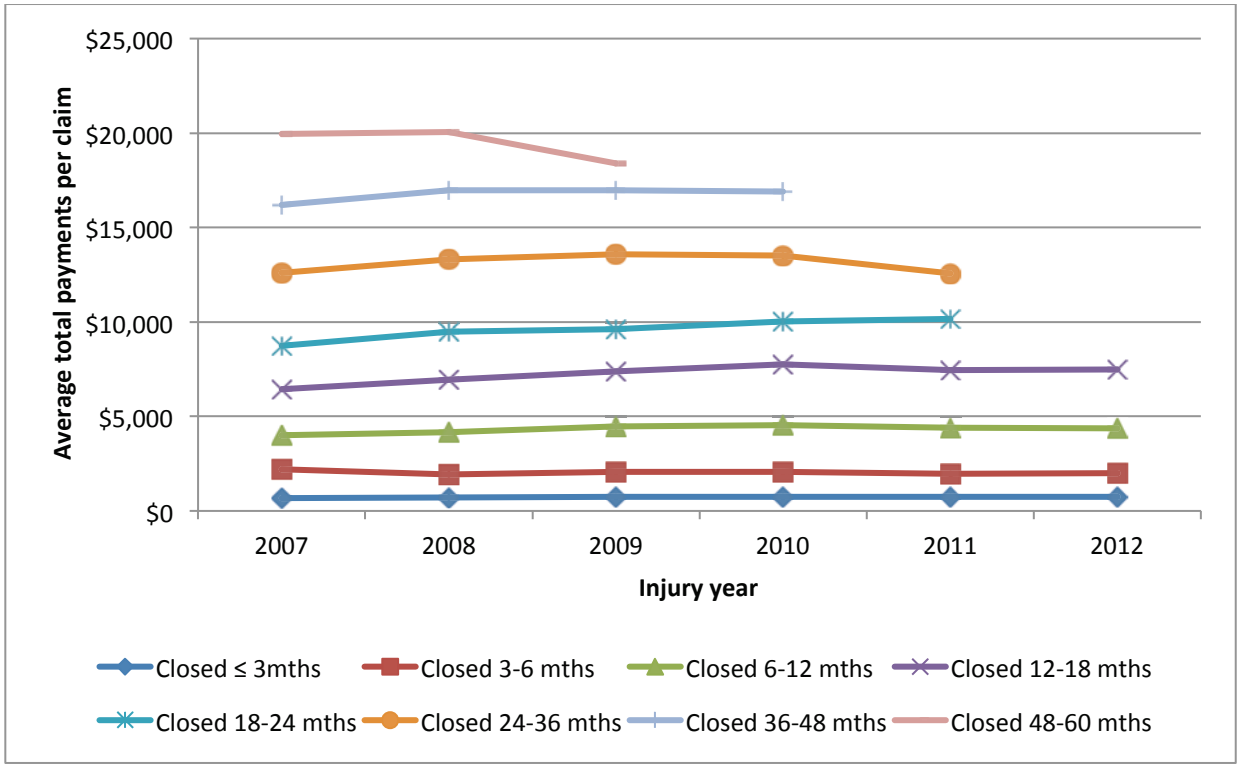
Table 4.10. Percentage Change in Average Per-Claim Spending Within First 12 Months of Injury, Injury Years 2007–2012, by Region and Service Category

	Total	Bay Area	Central Coast	Central Valley	Eastern Sierra Foothills	Inland Empire	Los Angeles	North State–Shasta	Sacramento Valley	Sacramento Valley (N.)	San Diego	Out of State
Drugs	32	32	36	37	19	16	44	–12	41	20	64	–11
Evaluation & Management	20	21	22	25	32	23	16	15	29	26	21	0
Medicine	18	18	21	29	41	17	13	25	33	32	24	–20
Laboratory/ Pathology	389	187	251	274	96	593	548	67	126	291	315	171
Radiology	24	29	15	36	48	32	19	–1	40	15	29	–20
Surgery	21	27	7	21	44	25	23	8	27	13	27	–14
Outpatient Facility Services	18	7	20	49	53	26	7	45	38	34	9	–18
Inpatient Hospital Stays	17	35	–4	31	93	19	6	–2	43	54	7	–29

Tracking Claim Status over Time

We tracked spending per year for claims closed at different times and compared whether spending increased or decreased across injury years (Figure 4.18). Claims closed within three months of injury had the lowest amount of spending ($664 per claim for injury year 2007) and a 12-percent increase in spending from injury year 2007 to 2012. Claims closed between 12 and 18 months of injury ($6,443 per claim for injury year 2007) and 18 and 24 months of injury ($8,729 per claim for injury year 2007) had a 16-percent growth rate in spending from injury year 2007 to 2012.

Figure 4.18. Payments for Claims Closed at Different Times, by Injury Year

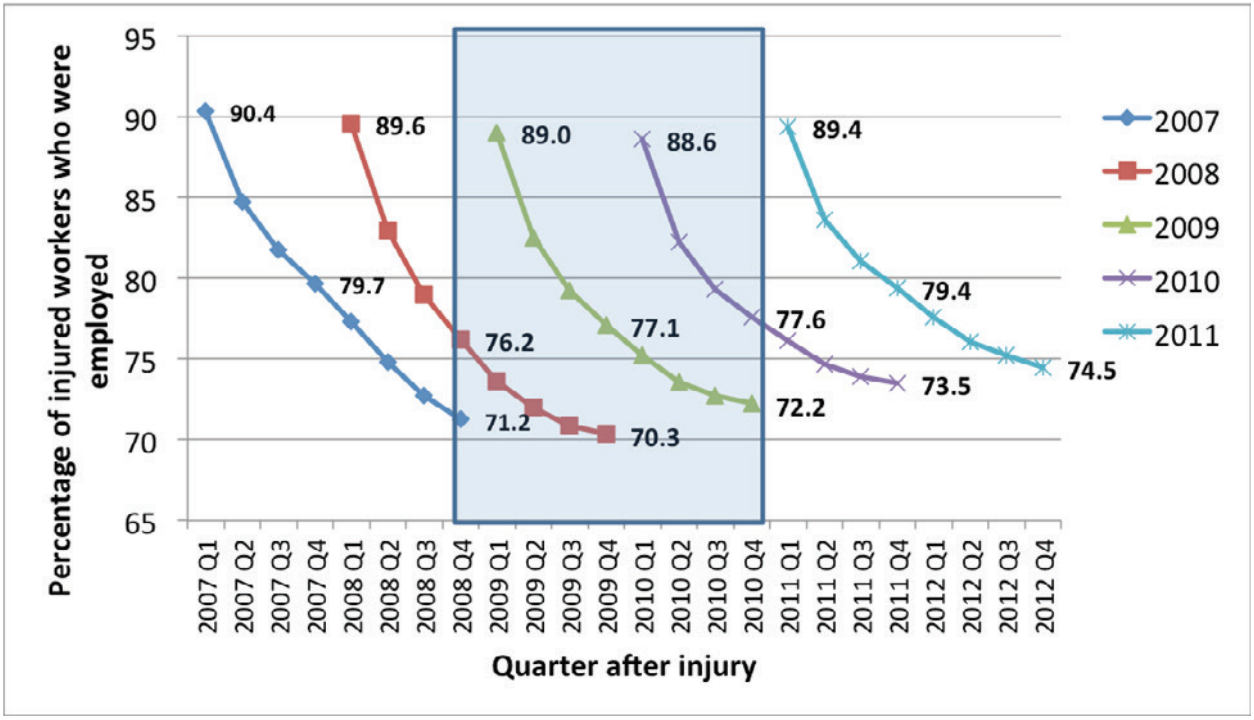


Work Outcomes

We used EDD data to track the proportion of injured workers who were still employed at the first eight calendar quarters after injury. The proportion of workers—injured or otherwise—that remain employed over time decreases due to exits from the labor force. Previous studies have shown that injured workers face lower future employment rates, possibly due to their work-related

injuries (Seabury et al., 2011; Dworsky et al., 2016).[7] Figure 4.19 reports the proportion of injured workers in each injury year that are employed in the first eight quarters after injury. The first point on each curve is the employment rate at 3 months after injury, and moving from left to right down each injury year curve provides rates through 24 months after injury. The horizontal axis is calendar months; the blue shaded region roughly represents the recession, where California employment overall decreased significantly. Employment rates for injured workers declined during the recession, as they did for all California workers. For example, 90.4 percent of workers injured in 2007 were employed at Q1 after injury compared with 88.6 percent of workers injured in 2010 at the height of the financial crisis and a higher 89.4 percent for workers injured in 2012 after the start of the recovery. Employment rates at 12–24 months were lowest for workers injured in 2008, again likely due to the recession.

Figure 4.19. Return-to-Work Outcomes, by Injury Year, All Injuries



[7] Dworsky et al. (2016) compared the percentage of California workers receiving permanent partial disability benefits who were working in each quarter following injuries occurring in 2005–2012 with a group of uninjured workers. About 85 percent of the uninjured workers were working after 12 months compared with about 62 percent of injured workers. For injury years 2008–2009, the ratio of employed permanently disabled workers to employed workers in the comparison group fluctuated between 0.70 and 0.72 over the first three years postinjury.

Despite the likely impact of the recession on return-to-work outcomes, the magnitude of the impact is small. While the overall California unemployment rate doubled from 2008 to 2010, employment at four quarters postinjury fell only 3 percent from 2007 to 2009 injuries.

Workers in Northern California are slightly more likely to be employed at all quarters after injuries than workers in Southern California (data not shown). We also tracked work outcomes by the type of injury (lower back pain, upper back, knee, and shoulder). We found that there were few differences across the categories (data not shown).

Limitations

Our monitoring analyses have important limitations. First, the WCIS data are constantly being updated, so our findings are a snapshot based on when the study file was extracted from the WCIS. Our data file was created in August 2016. While we believe that our WCIS study data are nearly complete, we may be missing some services delivered to workers injured in 2012, and claim counts for the medical data may change. The result would be downward biased utilization and spending measures that are derived from data for 2012 and 2013.

Second, due in part to the same timing issue, we are limited in our ability to follow up more recent injuries, for example, 2013 injuries. This also means that the measures that cover more than the first 12 months postinjury do not include the later injury years (for example, Figures 4.7 and 4.18).

Third, the trend analyses may also be biased by the efforts DWC has made to improve data reporting and the higher compliance rates by insured versus self-insured employers. Improved reporting over time would overstate the actual utilization and spending growth. On the other hand, if payers that have been reporting relatively complete data cease to do so, this would understate the actual utilization and spending growth.

Fourth, WCIS data limitations preclude us from examining utilization patterns and trends by MPN versus non-MPN care and type of claim. DWC has made efforts to improve how MPN care is reported so that this variable may become more reliable in the future.

Fifth, the results in some tables, such as those by payer status, may be affected by injury-year changes in the mix of injuries that are included in the category. For example, there may be an effect on spending and utilization by payer category from employers that change from self-insured to insured status or vice versa. A different issue is posed by our geographic assignments based on the address of record in the FROI. This address may change throughout the life of the claim, but all services are assigned based on the most recent address.

Finally, we rely on a complex set of programs to clean and categorize the WCIS data. While these programs address a wide range of data concerns and issues, they may themselves introduce bias into our analyses.

Key Findings

- Average per-claim spending within 12 months of injury was highest for injury year 2010. Per-claim spending for injury year 2012 increased 24 percent over injury year 2007, or about twice the increase explained by price inflation.
- Per-claim utilization and spending patterns for hospital services, clinical laboratory services, and drugs in the first 12 months following injury are notably different than for other services.
  - Per-claim spending on outpatient hospital services and inpatient hospital stays increased substantially through injury year 2010 and then decreased for injury years 2011 and 2012 due to lower service volumes. Data reporting issues may be contributing to the lower service volumes. At the same time, hospital inpatient and outpatient spending per user was substantially higher than that for injury year 2007. This suggests an increase in the intensity of the services. Spending for inpatient services may also have been affected by the pass-through payments for spinal hardware.
  - Utilization and spending for laboratory and pathology services increased dramatically over 2007–2012.
  - The number of prescription drugs per user peaked in injury year 2010 but spending continued to increase. Drug spending per user in injury year 2012 was 38 percent higher than for injury year 2007.
  - There are significant differences in both utilization and spending across geographic regions, types of injuries and selected conditions, and type of payer.
- Overall return-to-work outcomes for the first eight quarters dipped slightly during the recession but rebounded in 2011, so the outcomes are generally unchanged.

Discussion

Monitoring changes in utilization, spending, and work outcomes can provide actionable information on how the California WC system is changing over time. Information from this and other monitoring efforts can help inform the design of policies to amplify trends that improve value and outcomes for injured workers or to mitigate potential barriers to access or other problems. The figures and tables in this report can be easily updated over time to add new data as they become available. Further, the figures and tables are supported by underlying data that can be used to drill down to examine specific topics in more depth.

Variation in measures across geography, nature of injury, and other dimensions is a broader theme that applies to all of our monitoring results. These categorizations are increasingly useful due to cleaner and more consistent WCIS data. The analyses in this study are descriptive in nature and do not take into account changes in claim characteristics that might affect the results within the different categories used in the tables. Multivariate analyses that control for these differences would further inform the analysis of utilization and spending trends.

We anticipate that the monitoring system will evolve over time and that the selected measures will be refined through additional analyses. Given the different spending patterns for medical-only and indemnity claims, priority should be given to developing methods to categorize utilization and spending by type of claim. Even if additional analyses confirm that medical-only claims cannot be reliably identified in the WCIS data, our analysis of claim closure rates suggests that it would be informative to separately examine claims that have no additional medical activity after three months and claims that receive medical care over a longer duration of time.

5. Monitoring Trends in Quality Indicators

Introduction

In this chapter, we discuss the quality indicators that we use in the monitoring system. The indicators build on the framework for monitoring clinical performance using administrative data (Wynn, Timbie, and Sorbero, 2011). The framework anticipates that the clinical measures address an area that affects the health of injured workers or the cost of care and for which performance is known to be low or in which wide variation exists. The measures should be methodologically sound, based on valid scientific evidence, and feasible to implement using WCIS data.

Analytic Approach

Data

See Chapter Two for a general description of the WCIS data that we used for these analyses.

Quality Indicators

We developed our quality measures for the four conditions in the monitoring system based on a review of clinical measure repositories and the literature and an assessment of whether the measure could be developed from administrative data. Our methods for identifying potential measures are found in Wynn, Timbie, and Sobero (2011) with respect to low back pain. We used a similar process for the other conditions included in the monitoring system: shoulder injuries, knee injuries, and upper back/neck injuries. Many more measures can be constructed using medical record review as the primary data source, but chart review imposes an administrative burden that may not be feasible for an ongoing monitoring system. In total, there are five indicators that apply to one or more conditions (Table 5.1). These evidence-based indicators can be used to monitor trends in the quality of care delivered to injured workers. Each indicator is described in more detail in Appendix B. All measures are expressed as a percentage of WC claims assigned to the relevant condition. Lower values are better for all measures.

Results

Figures 5.1 and 5.2 track the performance of California WC claims on the imaging and opioid use indicators. The imaging indicators are relatively stable over time (Figure 5.1) with the exception of the use of imaging studies within the first 28 days for uncomplicated lower back pain. This measure starts at a substantially higher level than the comparable measure for upper

Table 5.1. Overview of Quality Indicators by Condition and Source

Indicator	Conditions	Measure	Source
Use of imaging studies within 28 days following the first visit within an episode of care	Low back pain, upper back, shoulder	*Numerator:* Claimants in the denominator condition who had an imaging study performed within 28 days of the first ambulatory encounter[a] *Denominator:* All claimants with an initial uncomplicated lower back, shoulder, or neck/upper back diagnosis	Source: National Committee for Quality Assurance (NCQA, 2016)[b]
Magnetic resonance imaging (MRI) lumbar spine for low back pain without appropriate antecedent care (percentage of injuries)	Low back pain	*Numerator:* Claimants in the denominator condition who did not receive either physical therapy or chiropractor services or injectable analgesic care within 60 days preceding the MRI, or an evaluation & management service 29–59 days preceding the MRI *Denominator:* All claimants with an initial uncomplicated lower back diagnosis who received an MRI	Source: Centers for Medicare and Medicaid Services (CMS, 2012)
Continuous opioid use for more than two weeks	Low back pain, neck, upper back, knee	*Numerator:* Claimants in the denominator condition who received an opioid prescription for more than 14 days (including continuous refills) during the first 24 months postinjury *Denominator:* All claimants with an initial lower back, upper back/neck, shoulder, or knee diagnosis	Source: American College of Occupational and Environmental Medicine (ACOEM, 2016)
Use of transcutaneous and percutaneous electrical nerve stimulation (TENS/PENS)	Low back pain (TENS/PENS), neck/upper back (TENS)	*Numerator:* Claimants with low back pain who received TENS or PENS or claimants with an upper back injury who received TENS during the acute or subacute phase of the injury (first 90 days) *Denominator:* All claimants with an initial low back pain or upper back diagnosis	Source: (ACOEM, 2016)
Electromyogram and nerve conduction studies	Shoulder, knee	*Numerator:* Claimants in the denominator condition who received an electromyogram/nerve conduction study within 28 days of the first encounter *Denominator:* All patients with an initial shoulder or knee diagnosis	Source: (ACOEM, 2016)

[a] Based on the ACOEM guideline recommendations, X-rays, computed tomography (CT) scans, and MRIs are included in the imaging measure for uncomplicated low back pain and upper back/neck injuries. The measure for shoulder injuries includes only CT scans and MRIs. Knee injuries are not included because the ACOEM guidelines anticipate that absent red flags X-ray might be used in the evaluation of knee pain within 28 days.
[b] The NCQA measure is for low back pain. We adapted the measure for the WC population and expanded it to include upper back and shoulder injuries based on the ACOEM guidelines for these injuries. The NCQA measure applies to ages 18–50. We did not include this age restriction because the ACOEM guidelines do not include one.

Figure 5.1. Percentage of Injuries Identified by Imaging Indicators, by Injury Year and Condition

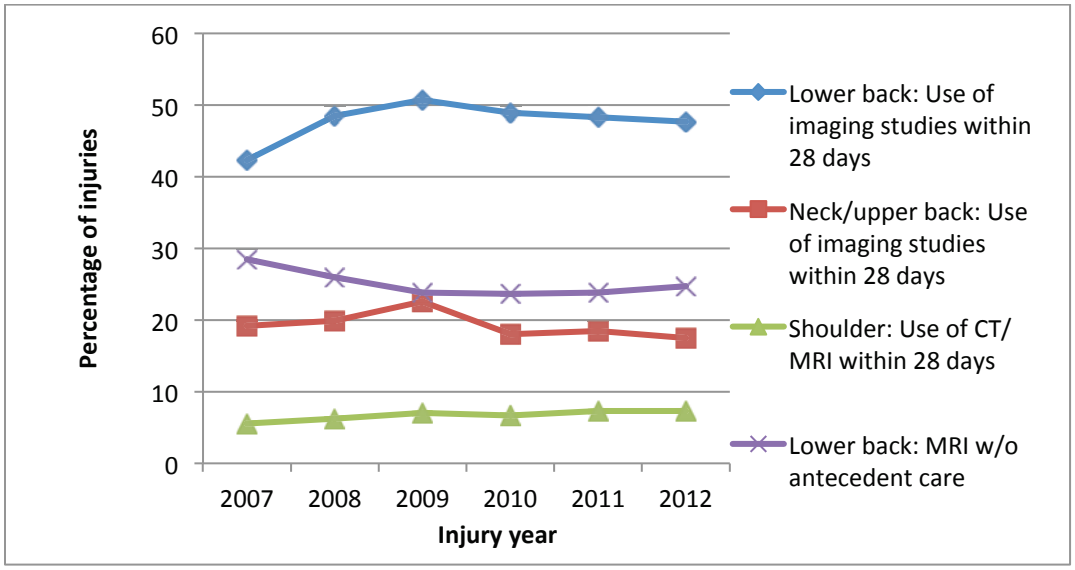
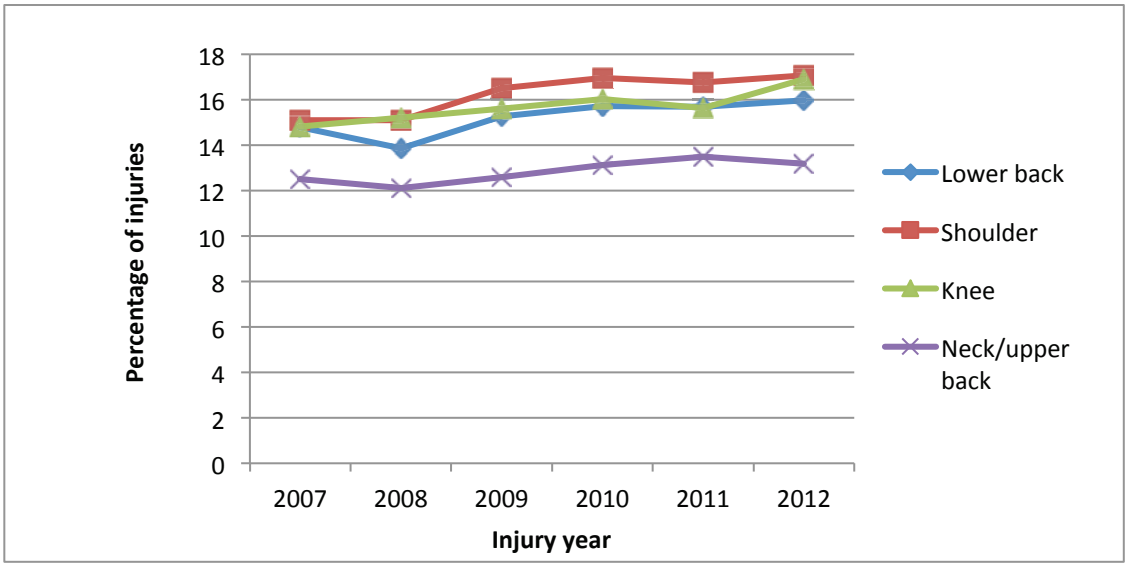


Figure 5.2. Percentage of Injuries with Continuous Use of Opioid Prescriptions for More Than 14 Days During First 24 Months Postinjury, by Injury Year and Condition



back pain (42 percent versus 19 percent) and increases to a high of 51 percent in 2009 before beginning to decline slightly in subsequent years. The imaging use measure for shoulders is much lower (6 percent in 2007), but unlike the measures for lower back pain and upper back/neck, it includes only MRIs and CT scans and does not include the use of X-rays. The measure tracking the share of injured workers with a supply of opioids greater than 14 days increased from 2007 through 2011 but decreased in 2012 (Figure 5.2).

We found very low utilization rates for our other measures. This implies that the services are being furnished and paid consistent with the Medical Treatment Utilization Schedule (MTUS) guidelines but does not inform whether services are being denied through the medical necessity determination process.[1] The use of TENS and PENS for low back pain in the acute and subacute phases fluctuated from less than 1 percent in most years to a high of 4 percent in 2009 (data not shown). The use rates for TENS for shoulder injuries were also low. Similarly, the use rates for both electromyograms and nerve conduction studies within the first 28 days following an initial encounter for shoulder injuries and knee injuries were less than 1 percent across all injury years (data not shown). Given these low usage rates, we present only the results from our analyses applying the imaging measures and the measure for opioid usage.

We found considerable heterogeneity across regions in terms of performance on the imaging indicators. To illustrate, we provide results for the usage rates for imaging studies within 28 days of the initial ambulatory encounter for uncomplicated low back pain injuries (Figure 5.3) and continuous opioid use for more than 14 days (Figure 5.4). The results are pooled for 2007–2012 injuries in order to have a sufficient denominator for the smaller regions. There are important differences in the use of imaging studies measures that appear even in the Northern California (36 percent) versus Southern California (53 percent) comparison. In terms of individual regions, the highest rates are for Los Angeles (56 percent) and the Inland Empire (58 percent), while the North State–Shasta region has the lowest rate (33 percent). The measure for more than 14 days of continuous opioid usage ranged from 18 percent of low back pain injuries in the Inland Empire and North Sacramento Valley to 11 percent in the Bay Area. By payer, the insured usage rates are higher than the self-insured rates on both measures (Figure 5.5).

[1] The measures reflect use rates after any utilization review and independent medical review determinations have been implemented and include only services for which payment was made. The volume of independent medical review appeals for electromyograms and nerve conduction studies is much higher than for TENS/PENS and nearly all utilization review denials are upheld. The uphold rate for TENS is 91 percent (RAND analysis of independent medical review decisions posted on the DWC website as of February 28, 2017).

Figure 5.3. Percentage of Injuries with Imaging Studies Within 28 Days of Initial Ambulatory Encounter, Uncomplicated Low Back Pain Injuries Occurring in 2007–2012, by Region

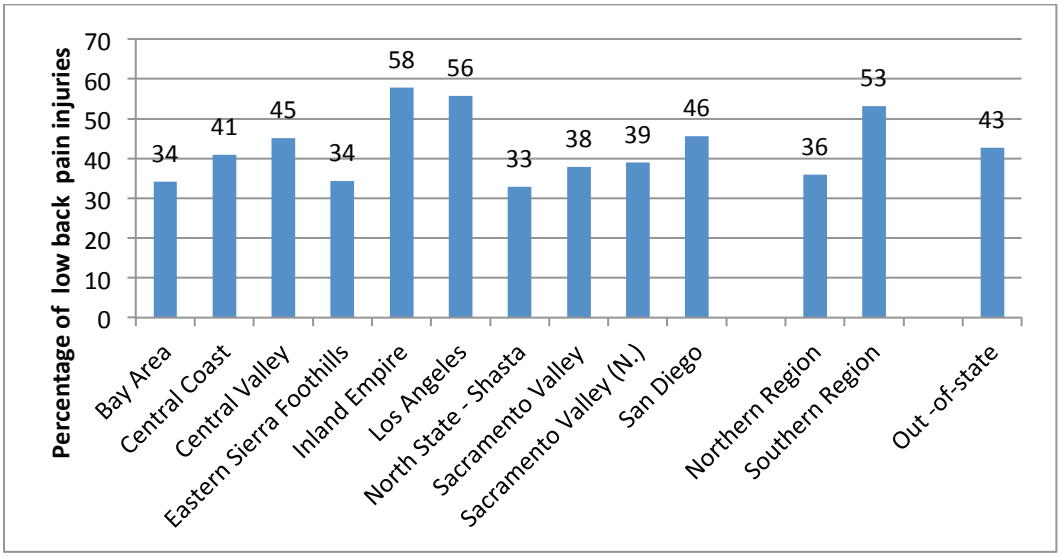


Figure 5.4. Percentage of Low Back Injuries Occurring in 2007–2012 with Continuous Opioid Use for More Than 14 Days Within First 12 Months Postinjury, by Region

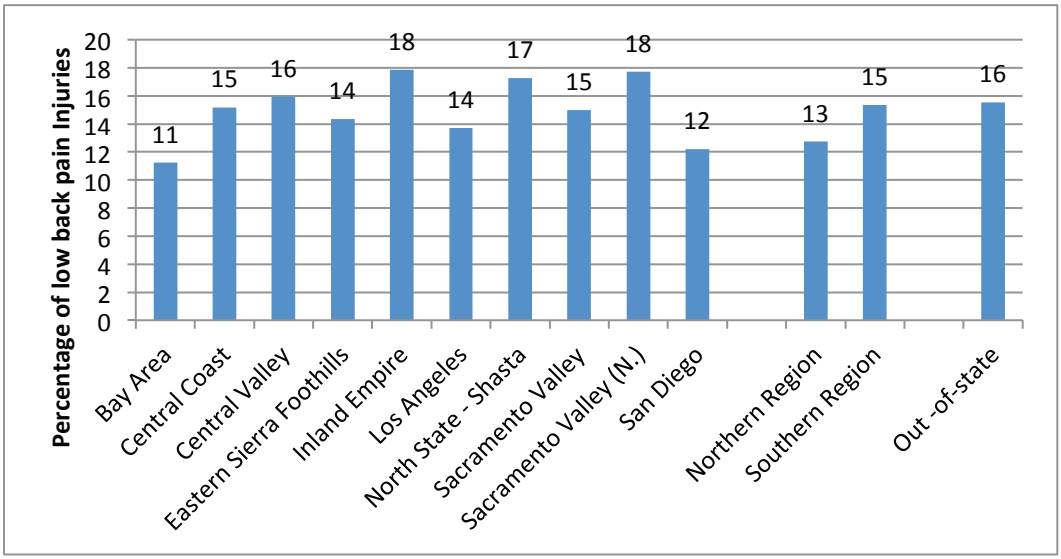
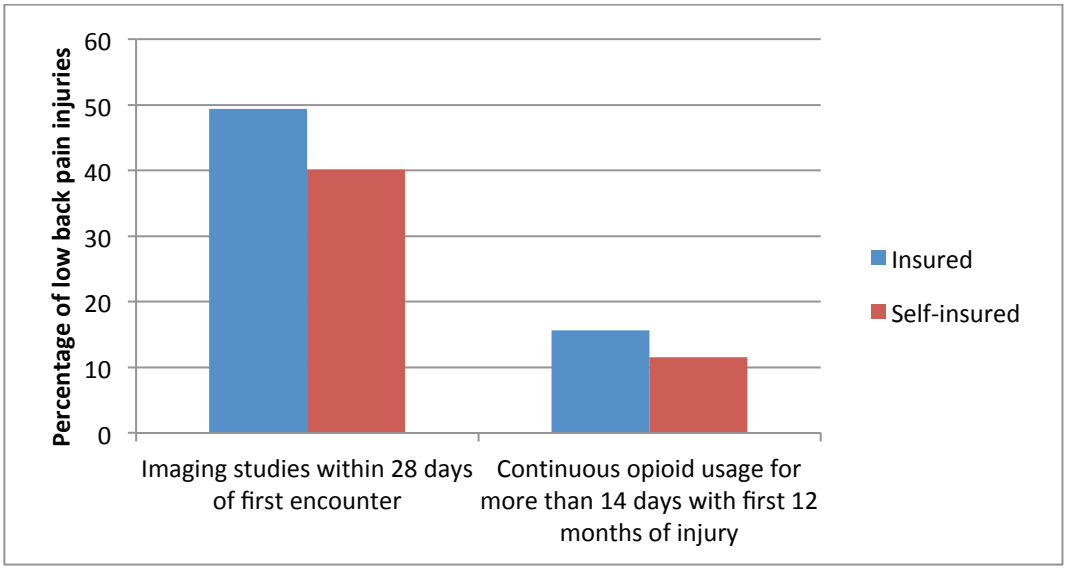


Figure 5.5. Quality Indicators for Use of Imaging Studies and Continuous Opioid Use, Low Back Pain Injuries Occurring in 2007–2012, by Type of Payer



Limitations

Our choice of indicators is limited to those that can be measured through administrative data for the selected study conditions. The limitations of the WCIS data discussed in Chapter Four generally apply. The indicators consider paid services only and do not capture services that were denied either prospectively or retrospectively. In addition, some indicators have a relatively small number of claims when subcategorized by claim characteristics such as geography that make the results less reliable. We addressed this issue by pooling the data across years. In doing so, we compare the differences in care patterns but lose the ability to examine trends.

Key Findings

The indicators for use of imaging within 28 days of the initial ambulatory encounter trend in the wrong direction through 2009 before showing some improvement in 2010–2012. However, the measure for use of an MRI for uncomplicated low back pain without appropriate antecedent care improved through 2009 with minor changes in the usage rates thereafter. Despite the issuance of the chronic care guidelines in 2009, there has been an upward trend in the continuous use of opioids for more than 14 days. The measures for use of TENS and nerve conduction studies found very low usage rates during the acute phase of the injury. There is variation in performance across payers and geographic regions in the measures.

Discussion

Quality indicators can be a valuable tool in identifying opportunities to improve the value of care provided to injured workers by reducing the volume of inappropriate medical services that are paid under WC. The MTUS guidelines address the care underlying the indicators, and our measures are consistent with those guidelines. Given the guidelines, the differences in performance on the imaging and opioid measures across the subcategories of claim characteristics are difficult to explain. In addition to measuring system performance, the indicators could be used to drill down to identify any aberrant practice patterns that are contributing to the differences.

We chose a set of quality indicators a priori for this study to illustrate how quality indicators could be implemented using administrative data. Performance on these measures in the future may be affected by the implementation of the independent medical review process established by SB 863 and the adoption of updated and expanded MTUS guidelines. The selection of quality indicators in the future should be guided by findings from ongoing monitoring of utilization and costs.

Attention should be given to ways to translate the results into more actionable information. For example, providing payers with benchmarking on their performance could be helpful in reducing unnecessary care and, at least with respect to opioid usage, improving outcomes. Restrictions on the use of the WCIS data preclude at present public release of information at either the payer or the provider level. It would be premature to consider doing so before there is improved compliance with the reporting requirements. The indicators should also be reviewed to determine whether further refinements are needed to account for additional factors that affect performance (such as whether the exclusions in the imaging measures are sufficient to identify red flags and whether the opioid use measure should vary by injury phase or have exclusions). If further research concludes that reliable measures can be developed at the payer or provider level, public release might ultimately be an effective tool in improving both the quality and the efficiency of care provided to injured workers.

6. Monitoring Trends in Access to Medical Care

Introduction

This chapter describes the access measures that we implemented in our monitoring analyses. These analyses track trends in the setting in which initial (non–first aid) care is delivered, timeliness of initial nonemergent care following an injury, and the number of PCPs involved in care during the first 12 months following an injury. In Chapter Seven, we explore indirect measures related to access to physician services.

Analytic Approach

Data

See Chapter Two for a general description of the WCIS data that we used for these analyses.

Access to Care Indicators

We designed our access indicators to track trends in care provided to injured workers during the first 12 months following the date of injury. The access to care measures focus on trends in the type of initial encounter following injury, the timeliness of nonemergent care, and the number of PCPs involved in providing care. Our underlying assumption for the third measure is that most workers who are satisfied with their PCP will remain with that provider. Provider "churn," when an injured worker sees multiple PCPs within the first 12 months, could be indicative of worker dissatisfaction with care or difficulty seeing a preferred provider. However, it could also be indicative of complex care issues requiring specialized care that the initial provider is less equipped to provide or the injured worker going to a group practice with extended office hours.

We calculated and analyzed the following measures for all JCNs and for JCNs stratified by injury category and region:

> *Type of first encounter*: This measures the type of first encounter in the medical data following injury. We classified the initial service for a given JCN with a specific or multiple injury into one of six mutually exclusive visit categories: (1) emergency department (ED) visit, (2) primary care E&M visit in an outpatient setting, (3) non–primary care E&M visit in an outpatient setting, (4) other visit in an outpatient setting, (5) physical therapy visit in an outpatient setting, and (6) other. We did not initially anticipate the need for the physical therapy category because injured workers should first see a treating physician. We added this category after we found that a nontrivial share of injured workers had an initial WCIS record for physical therapy services. This could be following an initial

first-aid visit for which no medical bill was submitted or missing E&M visits. We excluded JCNs that did not have a medical encounter within a year of injury.

Days from injury to first non-ER E&M visit: This measure is the number of days from injury to an index date within a year of injury. The index date is the minimum service date among services for a given JCN with a place of service other than "emergency department" (place of service code 23), a Healthcare Common Procedure Coding System (HCPCS) code in the E&M range (99201-99215 and 99241-99245), and a type of service classified as E&M, medicine, surgery, or outpatient facility service. We excluded JCNs without at least one non-ED service in the E&M range (set to missing).

Proportion of JCNs that switch PCPs: This measure is a dichotomous indicator equal to one for injured workers that have E&M visits with multiple providers identified as PCPs within a year of injury. E&M visits are subset to services with an HCPCS code in the E&M range (99201-99215 and 99241-99245) and a type of service classified as E&M or outpatient facility service, and with a provider primary billing specialty of multispecialty group practice, family medicine/general practice, internal medicine, or occupational medicine (MD). We did not calculate this measure for JCNs without at least one service that fits into the above criteria.

Number of PCPs: This measure is the count of unique providers identified as PCPs that a patient sees within a year of injury. E&M visits are subset to services with an HCPCS code in the E&M range (99201-99215 and 99241-99245) and a type of service classified as E&M or outpatient facility service, and with a provider primary billing specialty of multispecialty group practice, family medicine/general practice, internal medicine, or occupational medicine (MD). We did not calculate this measure for JCNs without at least one service that fits the above criteria.

Results

Gaps Between Injury Date and First Encounter

We found that some injured workers have very long gaps between injury date and their first medical care reported in WCIS. For example, in 2012, the top 5 percent of injured workers waited 120 days or longer from injury to first nonemergency E&M visit, and the top 1 percent waited 286 days or longer. We believe that it is more likely due to a set of underlying issues with our WCIS data rather than a potential access issue. One potential concern is that we are missing the bills associated with initial medical treatment for some injured workers. Another potential concern is that the date of injury recorded in WCIS is significantly different from the date the injury was first reported to employers, particularly for injured workers with cumulative injuries such as carpal tunnel syndrome.

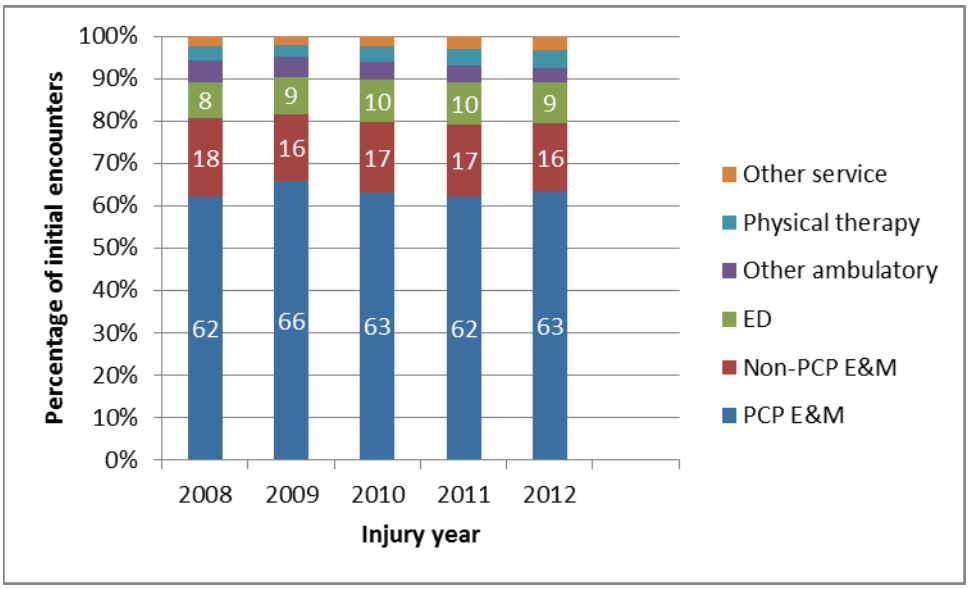
While there is little that we could do to investigate the issue of missing bills, we were able to compare the injury date with the date the injury was first reported to employers. For 2007 injuries, we found that 4.4 percent of cumulative injuries reported as the nature of injury in the FROI had a first reported date that was one year or more after the recorded injury date in WCIS.

We found some extreme outliers—including injury dates several decades prior to the date the injury was first reported to the employer and the first service date. Overall, calculating times from first report date rather than injury date results in smaller time-based access measures. For example, for the time to first nonemergency E&M visit measure and for 2012 injuries, the mean and median days using the injury date were 20.8 and 3.0 days, compared with 16.9 and 1.0 days, respectively, when using the first report date instead. Due to these concerns, we report medians (and the 25th and 75th percentiles) for time-based measures, for example,, days from injury to first E&M visit. We elected to use the injury date as a consistent starting point because first report date was missing for some injured workers.

First Encounter

Most injured workers with a specific injury or multiple injuries had an initial encounter in an ambulatory setting (office or hospital outpatient department), were seen by a PCP, and received at least one E&M service (Figure 6.1). In 2012, 63 percent of these encounters were ambulatory E&M visits with a PCP. The initial encounter for another 16 percent of injured workers was an ambulatory E&M service with a non-PCP. In sum, more than four in five injured workers had an initial E&M visit in an ambulatory setting. While the ED is an expected first encounter for some severe or otherwise acute injuries, relatively few injured workers—9 percent—had an initial encounter that was an ED visit.

Figure 6.1. Type of First Encounter Following a Specific Injury or Multiple Injuries, Injury Years 2007–2012



The remaining 10 percent of injured workers in injury year 2012 had a first encounter that does not at first inspection appear to be a typical entry into the WC system. Our findings for these injured workers probably reflect a mix of uncommon treatment pathways and issues with the WCIS data. Some injured workers within this category (30 percent) had an initial ambulatory visit that did not involve an E&M service, such as a radiology service. Another 40 percent of injured workers had a first encounter for physical therapy services in an ambulatory setting. In both cases, it may be that these workers received first-aid treatment for which a medical bill was not submitted or the billing data may be incomplete. Finally, 30 percent of injured workers have a first encounter that cannot be categorized into one of the other categories described above.

The overall pattern of where injured workers obtained initial care was relatively stable over the study period. There were some fluctuations in the proportion of injured workers that first accessed care through hospital EDs, which increased from 8.2 percent in injury year 2007 to 9.5 percent in injury year 2012. Also, injuries in 2012 were more likely to have an initial E&M visit with a PCP than injuries in 2007.

Timeliness of Initial Care

With regard to timeliness of initial nonemergency E&M care, we found that the median time from an injury to an initial E&M visit was two days from 2007–2011 and three days in 2012. The 75th percentile increased over this time from 9 days to 13 days. Table 6.1 reports trends in the days to first E&M visit measure by type of injury. At most, there was only one day difference across the injury categories in the median time from an injury to an initial E&M visit, but the variation at the 75th percentile was more marked. For example, the 75th percentile in 2012 for upper back injuries was 23 days compared with 12 days for lower back pain.

There is also little difference between Northern and Southern California in the median days from injury to first E&M visit (Figure 6.2). There is also little difference in changes in the median days to first E&M visit measure over time.

Changes in Primary Care Provider

The second type of access to care measure determines the proportion of injured workers that see multiple PCPs. Figure 6.3 plots the proportion of injured workers seeing multiple PCPs in the first year after injury on the left axis and the average number of PCPs seen in the first year after injury on the right axis. Both measures increase in magnitude from 2011 to 2012, although the relative increases are small—about 3 percentage points in both cases.

Table 6.1. Days from Injury to First Nonemergency E&M Visit, by Injury Year and Type of Injury

	2007	2008	2009	2010	2011	2012
All Injuries	0	0	0	0	0	0
25th Percentile						
Median	2	2	2	2	2	3
75th Percentile	9	9	9	9	12	13
Low Back Pain						
25th Percentile	1	0	0	1	1	1
Median	3	2	2	3	3	3
75th Percentile	10	9	8	9	12	12
Upper Back Injuries						
25th Percentile	1	0	0	1	0	1
Median	3	3	3	3	4	4
75th Percentile	13	14	14	16	22	23
Shoulder Injuries						
25th Percentile	1	1	1	1	1	1
Median	4	3	3	3	4	4
75th Percentile	16	15	14	16	23	21
Knee Injuries						
25th Percentile	1	1	1	1	1	1
Median	3	3	3	3	3	4
75th Percentile	13	13	11	13	15	16

Figure 6.2. Median Days from Injury to First Non-ED E&M Visit, by Injury Year and Region

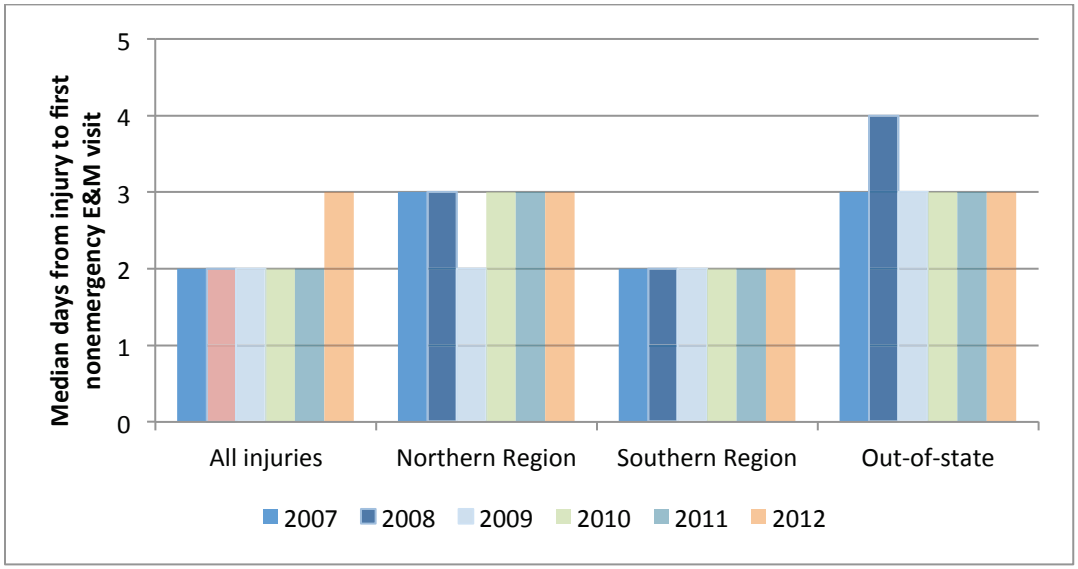


Figure 6.3. Proportion of Injured Workers Seeing Multiple PCPs Within a Year of Injury, and Average Number of PCPs Seen, by Injury Year

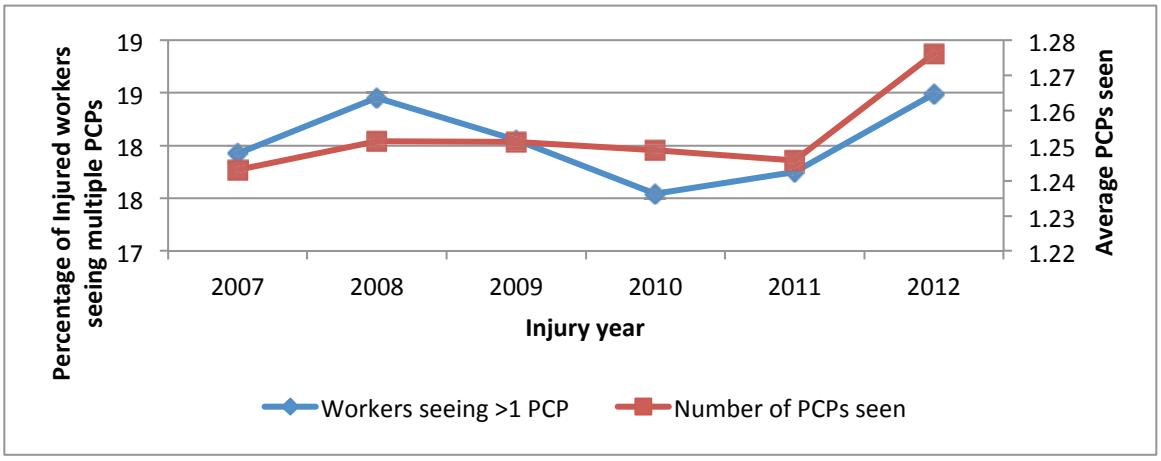


Figure 6.4 presents differences in the number of PCPs seen during the first 12 months following date of injury across the different types of injury categories. A higher number of PCPs were seen in each of the four injury categories than in the "all other injuries" category. The differences between the injury categories are small, and all four categories show an increase in the measures between 2011 and 2012. There are also some differences in this measure across geographic regions (Figure 6.5). Southern California injuries have slightly higher values

Figure 6.4. Average Number of PCPs Seen Within One Year of Injury, by Injury Year and Type of Injury

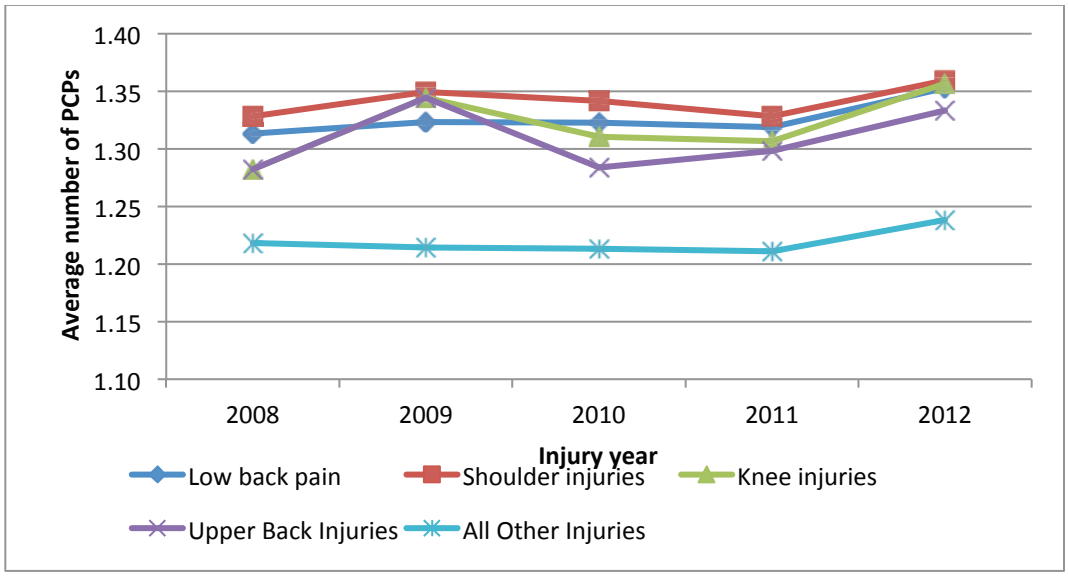
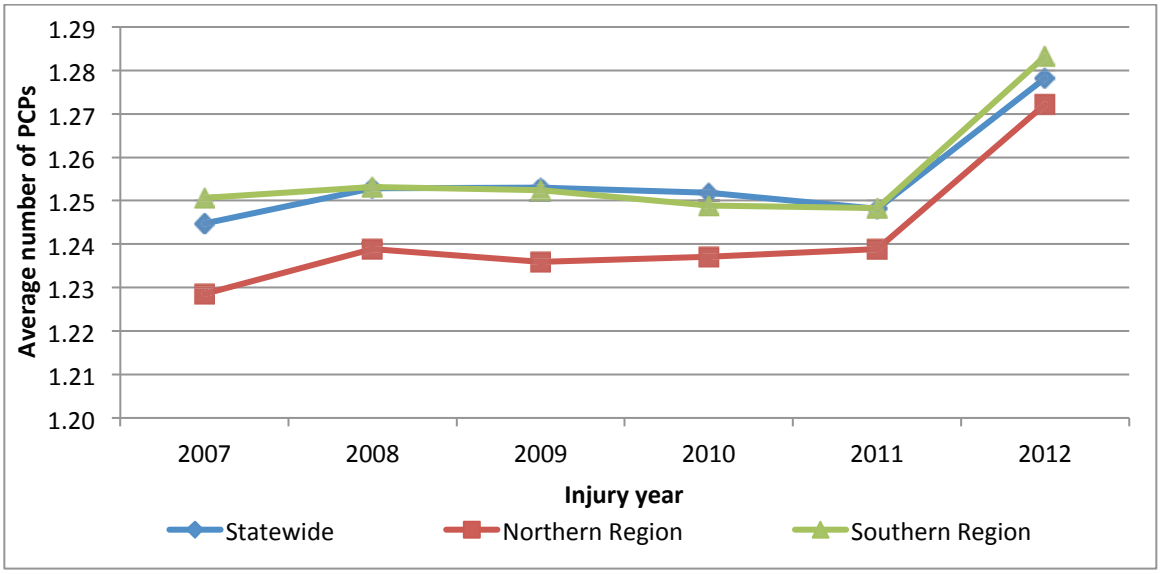


Figure 6.5. Average Number of PCPs Seen Within One Year of Injury, by Injury Year and Region



(between 1 and 2 percentage points higher), but the trends between Northern and Southern California are parallel.

Limitations

In general, most limitations discussed in Chapter Four apply to the analyses in this chapter. In addition, reliable reporting of first encounters in the medical data is critical to the access measure results and interpretation. The high volume of therapy and physician non-E&M visits (such as radiology) that are the first encounters in the WCIS medical data suggest that some initial encounters may not be reflected in the WCIS data. Without further investigation, we do not know whether these are primarily first-aid visits for which no billing was generated or whether there is underreporting of initial medical visits. Missing data may also explain some of the gaps between the injury date and the date of the initial encounter, particularly when the injury was promptly reported to the employer.

Our measure for the number of PCPs seen by the injured worker is based on the number of unique National Provider Identifiers (NPIs) reported in the WCIS data and does not account for changes in individual providers within a group practice that bills using a group NPI rather than individual provider NPIs. Conversely, if the group practice uses individual NPIs, provider changes within the group practice are accounted for. In this situation, however, the results would also count a provider change if an injured worker goes to a group practice that has expanded office hours to accommodate patient needs and sees a different provider during the extended hours.

Key Findings

Gaps Between Injury Date and First Encounter

We found that some injured workers have very long gaps between injury date and the date of their first medical encounter reported in the WCIS. For some claims, we may be missing bills associated with an earlier encounter. For others, there are significant gaps between the date of injury and the date the care is first reported to the employer, particularly for injured workers with cumulative injuries such as carpal tunnel syndrome.

Type of First Encounter

Most injured workers have an initial encounter in an ambulatory setting for E&M services furnished by a PCP. In 2012, 63 percent received an E&M service from a PCP compared with 16 percent from a non-PCP. The proportion of initial encounters in an ED fluctuated over 2007–2012 and was 9.5 percent in 2012.

Timeliness of Care

The median number of days from injury to first nonemergency E&M visit has remained relatively constant from injury year 2007 to 2012. The median number of days for all injuries remained at two days through 2011 and increased to three days in 2012.

Number of Primary Care Providers

There is a modest upward trend in both the proportion of injured workers seeing multiple PCPs within 12 months of injury and the average number of PCPs that they see. The average number of PCPs seen within one year of injury is slightly higher in Southern California than in Northern California.

Discussion

Further investigation of the WCIS claims data is warranted to ascertain whether the results in this section—and particularly outliers with significant gaps between injury and initial care—reflect data reporting issues, the increase in cumulative trauma injuries, or potential access issues. The type of first encounter analysis also suggests that further investigation is needed of the initial encounters that seem to circumvent requirements for initial evaluations from primary treating physicians. Some of the more unusual and seemingly inappropriate initial care may in part be due to data challenges and limitations noted above. It is possible that initial encounters with PCPs are missing in the WCIS data for some injured workers, and as a result the initial encounter that we observe in an unusual setting actually follows other care that we do not observe. In the interim, measures that are derived to assess the timeliness of access to care need

to be carefully constructed to account for these aberrant pathways in a way that does not distort overall access measures.

There is limited ability to investigate these issues through the WCIS data. Each physician who attends an injured worker is required to file a Doctor's First Report of Injury within five days of an initial examination of the worker. The report documents the nature of an injury or illness, how it occurred, which body parts were injured, the treatment that was provided, and the work status of the injured worker. It is submitted by the treating physician to the employer's WC insurance carrier or the self-insured employer. Currently, the report is not collected or compiled electronically. However, SB 1160 recently amended Section 6409 of the Labor Code to require that the report be filed electronically with DWC. In the future, this report should provide valuable information for understanding how initial care is provided to an injured worker and the nature of the injury.

7. Physician Participation Rates and Payment Levels

Overview

The recent implementation of SB 863 reform has led to a range of changes in California's WC system. In particular, a new resource-based relative value scale (RBRVS) fee schedule was established for provider services, and the monitoring of MPNs was strengthened. These changes could affect WC patients' access to, and therefore outcomes of, care.

To provide background and a baseline comparison for future studies on the impact of SB 863 on WC patients' access to care, we examined retrospectively several measures indirectly related to access to physician services by WC patients. These include provider availability as measured by physician participation rates in WC (Section A), payment adequacy in comparison with commercial insurance payments for similar services (Section B), and potential market power of WC MPNs as reflected in fee discounting prior to the implementation of RBRVS (Section C).

A. Physician Participation Rates in WC

Analytic Approach

The overall objective of this section was to measure the proportion of active community physicians in California who treat WC patients. Our analysis mainly focused on the physician specialties that were most frequently reported in the WCIS data. Provider participation rates are one measure of the extent to which WC patients have access to necessary services. While important, they should be used in conjunction with other measures because participation rates are influenced by employer use of MPNs. The rates reflect not only a physician's willingness to provide services to injured workers but also whether a physician who is otherwise willing to provide services is included in an employer's MPN.

Data

We used several data sources for this analysis, including 2012 WCIS medical data (see Chapter Two for a detailed description), 2012 Medicare Fee-for-Service Provider Utilization and Payment data, 2013 Medicare Physician Compare public reporting data, and 2012 SK&A office-based physician data (CMS, 2014; CMS, 2013; CMS, 2012; Bing Center for Health Economics, 2014). The availability of data at the time of this analysis allowed us to focus on the data for 2012, which can serve as a baseline for future studies to track physician participation rates over time. Further, we conducted sensitivity analyses using the public-use file on licensed California

physicians furnished by the Medical Board of California (MBC) and the Area Resource File (ARF) maintained by the Health Resources and Services Administration.

The National Provider National Plan & Provider Enumeration System (NPPES) is a dataset created and maintained by the Centers for Medicare and Medicaid Services (CMS) that contains the unique identifiers for all health care providers and health plans. For health care providers, the data include the NPI, provider name, credential, business mailing address, practice location address, up to 15 health care provider taxonomy (specialty) codes, NPI deactivation status, and deactivation date if applicable. The data also identify whether the NPI is assigned to an individual or a group provider. Its downloadable version is updated monthly.

The Medicare Fee-for-Service Provider Utilization and Payment data (Medicare utilization data) contain information on Medicare utilization, submitted charges and payment by provider NPI, HCPCS code, and place of service. The data cover the physician/supplier Part B noninstitutional line claims for the Medicare fee-for-service population. For privacy purposes, any aggregated data derived from ten or fewer patients are excluded.

The Medicare Physician Compare Public Reporting data (Physician Compare data) include information on group practices participating in the CMS quality program and Physician Quality Reporting System. Of importance for our purpose, the file is organized at the individual NPI level with a group practice identifier that can be used to link individual physicians to their group practice. In 2013, nationally, 139 group practices of 25 or more eligible professionals participated in these programs and reported data.

The SK&A office-based physician database (SK&A data) is compiled by SK&A, a health care marketing company. The SK&A data contain several snapshots of nearly the entire universe of office-based physicians in the United States. The company refreshes the data every six months and collects information on physician NPI, practice address, gender, credential, up to three specialties, practice size, average practice patient volume, health care system affiliation, hospital affiliation, medical school, and graduation year.

The public-use file made available by the MBC contains information on allopathic (MD) physicians licensed to practice in California. The file contains an address of record for each physician and, for those responding to the practice survey at the time when licenses are renewed, additional information on practice characteristics and practice locations.

Unlike the other files, the ARF does not have provider-specific information. Instead, aggregate county-level data are provided by provider specialty based on the American Medical Association's Masterfile.

Methods

Our objective was to assess by specialty the proportion of physicians involved in patient care who serve WC patients. The seemingly simply research question is actually quite complex to answer. Not all physicians are involved in patient care, and some who are involved in patient

care are in residency training programs and would not be counted in the WCIS data; physicians self-report specialties and may practice in multiple specialties; and physicians who are licensed in California may practice elsewhere. Further, changes in practice locations may not be regularly updated. Finally, not all provider registries include doctors of osteopathic medicine (DOs), an important provider group for the WC patient population. Table 7.1 compares the three potential sources for our analysis.

We compared the aggregate MD counts that we estimated from using the NPPES, the Medical Board file of licensed physicians, and the ARF (Table 7.2). The counts from the ARF are the most straightforward to calculate because the results are aggregated and separate counts are available for nonfederal physicians involved in patient care.[1] The Medical Board counts

Table 7.1. Comparison of Potential Baseline Files of California Physicians

Characteristic	NPPES	MBC	ARF
Contains provider-level information	Yes	Yes	No
Contains information on MDs and DOs	Yes	No	Yes
Contains medical specialty	Multiple	Multiple	Primary
Contains practice location	Multiple but may not be current	Yes for 90% who responded to survey	Primary but may not be current
Contains NPI for linking to WCIS	Yes	No	No
Allows identification of medical residents for exclusion from analytic file	No	No	Yes
Allows identification of physicians who are not involved in patient care for exclusion from analytic file	No	Yes for 90% who responded to survey	Yes
Data currency	9/14	9/14	2013

Table 7.2. Comparison of Aggregate Physician Counts Using Alternative Data Sources

Count Definition	NPPES	Medical Board	ARF
Total count for California MDs with active license (excluding retired)	98,891	112,329	106,336
Nonfederal active physicians	NA	NA	103,760
Physicians active in patient care including residents-in-training	98,891 high estimate 70,456 low estimate	98,408	93,883

[1] There are counts for primary care residents but not for residents in other specialty training programs in the ARF. Because these counts are incomplete and residents cannot be identified in the other files, we do not report these counts in the comparison in Table 7.2.

include the MDs who report on the physician survey that they are in active practice and provide a California address of record or practice location (94,581 physicians). For those who did not respond to the survey, we were able to merge 3,827 (36.3 percent) by license number to an NPPES California physician and included them in the active patient care physician count. For the NPPES, we provide a range for the estimate of MDs involved in patient care. The high estimate is the number of MDs in the NPPES who list a California business mailing or practice address. The low estimate is based on a merge of NPPES physicians with the California MDs found in either the SK&A or Medicare files. We found that 71.3 percent of the NPPES California MDs were in at least one of the other files. The results show that except for the low NPPES estimate, the total counts of physicians active in patient care are fairly similar. The NPPES low estimate excludes residents and physicians who are not in specialties that provide services to Medicare beneficiaries or in office-based settings.

After reviewing the results in Table 7.2, we decided to use the NPPES file to develop our denominator counts. We concluded that it was more useful than the ARF because individual physicians are included and have the potential to be linked to other files. Moreover, the ARF uses specialty groupings that complicate our analysis of WC participation rates. The NPPES has an advantage over the Medical Board licensing file in that it includes an NPI that facilitates merges with the WCIS and other databases. Importantly, it contains information on other types of providers, including DOs and chiropractors. In this regard, the Osteopathic Medical Board of California does not maintain a public-use file listing licensed DOs that could supplement the MD counts.

We defined the universe of active community physicians as individual physicians in the NPPES who had a mailing address or a practice location in California. We defined participating physicians as those who submitted at least one bill in WCIS. To further refine the universe of active physicians and participating physicians, we merged individual physicians in WCIS with those in NPPES based on NPIs. Less than 2 percent (1.89 percent) of WCIS individual providers did not match to a valid NPI and were dropped from the analysis. Among the providers in NPPES but not in WCIS, we excluded those whose NPI was deactivated prior to the end of 2012 as well as providers whose primary specialty was obstetrics, geriatrics, forensic medicine (except forensic psychiatry), medical research, pediatrics, and specialties related to children/newborns, adolescents, school/college, or perinatal services. These are individual providers who are unlikely to serve WC patients. We calculated provider participation rates for all physicians as well as for the common specialties reported in WCIS. In calculating participation rates for each specialty, we included all physicians who are in the numerator for a given specialty in our denominator. For example, if a provider has a primary specialty of orthopedic surgery in WCIS but her or his primary specialty is not orthopedic surgery in NPPES, we considered her or his primary specialty as orthopedic surgery and included the provider in both the numerator and the denominator for orthopedic surgery.

We identified the most commonly reported specialties in the WCIS data, including orthopedic surgery, general surgery (including surgery of the hand), neurological surgery, plastic surgery, urology, family medicine, general practice, general internal medicine, internal medicine subspecialties, psychiatry, neurology, occupational medicine, physical medicine and rehabilitation, and chiropractic providers. Except for chiropractic providers, we focused on allopathic and osteopathic physicians to examine WC patients' access to physician care. We identify specialties based on health care provider taxonomy codes.

Since an individual provider can report more than one specialty, our analysis focused on primary specialty, defined as the most frequently reported specialty for an individual provider in WCIS. For active individual providers who did not appear in the WCIS data, we used the designated primary specialty (or the first specialty if no designated primary specialty was available) in NPPES.

To assess the geographic distribution of physician participation rates, we generated a map of California by hospital referral regions (HRRs), which are health care markets defined for tertiary medical care. There is at least one hospital in each HRR that performs major cardiovascular procedures and neurosurgery. We allowed a physician to have multiple practice locations; that is, a physician could be listed in more than one HRR based on WCIS billings.

In addition to the above analysis, we conducted several sensitivity analyses to examine whether our main findings were robust to other approaches. First, because some bills were submitted by providers using a group NPI in WCIS in 2012, we included all the individual providers practicing in these groups and assumed they served WC patients. After standardizing practice location addresses, we identified these individual providers through address matching within the NPPES. If an individual's practice location address was the same as a group's address, we considered her or him a participating provider. Second, we calculated participation rates using any reported specialties of interest rather than primary specialties. This allowed us to redefine the universe of active providers and participating providers when examining a specific specialty.

A limitation of using NPPES as the universe of active providers is that some providers may not be active in patient care, which would overstate the number of physicians that could potentially serve WC patients. As an alternative, we used Medicare and SK&A office-based providers as the universe for specialties that are common in Medicare (all specialties of interest except occupational medicine and chiropractic providers). The rationale is that most providers participate in Medicare, and if a provider actually delivered services to Medicare beneficiaries, she or he is active in patient care. In addition, because SK&A refreshes its data every six months, we treated physicians in the SK&A data file as active. We merged WCIS provider data using NPIs with Medicare Utilization data, Physician Compare data, and SK&A data. If a physician appeared in any of the three files, she or he was considered active in patient care. We also considered using the ARF to define the set of active providers, but the definitions of various

specialties were not necessarily consistent with our approach and the resulting participation rates for some specialties were greater than 100 percent. We therefore do not report the results based on the ARF data.[2]

Results

After excluding individual physicians who are unlikely to serve WC patients, we identified a total of 88,308 unique individual physicians in the NPPES. There were 23,784 physicians who billed as an individual physician in the 2012 WCIS data. The overall participation rate was 26.9 percent.

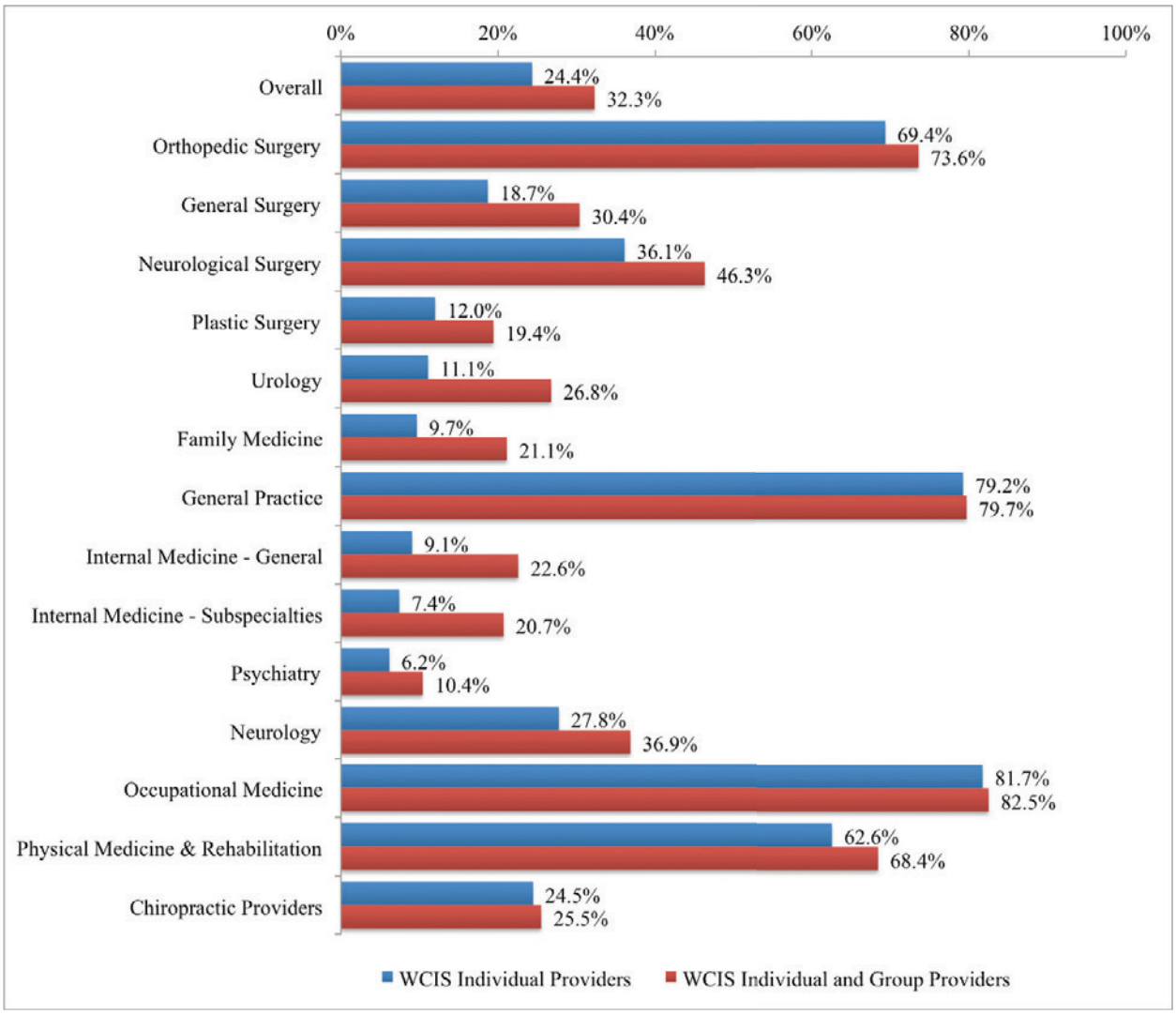
Among the individual physicians with one of the commonly reported specialties in the WCIS, 49.1 percent reported more than one specialty. Among physicians who reported multiple specialties in the WCIS, the average number of reported specialties was 3.6. Forty percent of the WCIS physicians practiced in more than one zip code area, with an average of 4.6 different zip code areas. Similarly, 21.0 percent of the WCIS physicians practiced in more than one HRR, with an average of 2.8 HRRs.

As shown in Figure 7.1, when using the NPPES as the universe of active providers in California and considering primary specialty only, about one-quarter of physicians participated in WC in 2012. However, participation rates vary significantly across specialties. For example, the participation rate was more than two-thirds for orthopedic surgery, general practice, occupational medicine, and physical medicine and rehabilitation. The rates were less than one-quarter for plastic surgery, urology, family medicine, internal medicine, and psychiatry.

As one of the sensitivity analyses, when considering both individual providers and those in a group NPI, we identified an additional 9,604 individual physicians who did not submit a bill as an individual but belonged to a group that submitted a bill using a group NPI in the WCIS. The overall participation rate increases to 32.3 percent. As shown in Figure 7.1, considering the primary specialties of interest only, about one-third of physicians (individual and group providers) participated in WC in 2012. Including individual providers of the groups that used a group NPI in the WCIS increases specialty-specific participation rates by up to 15.7 percentage points (urology), with larger effects among specialties with lower participation rates when considering individual providers only (e.g., general surgery and family medicine).

[2] The ARF data are reported only in the aggregate, so we were unable to determine how individual physicians with multiple specialties and/or practice locations were handled.

Figure 7.1. Physician Participation Rates Based on Primary Specialty Reported and NPPES Data



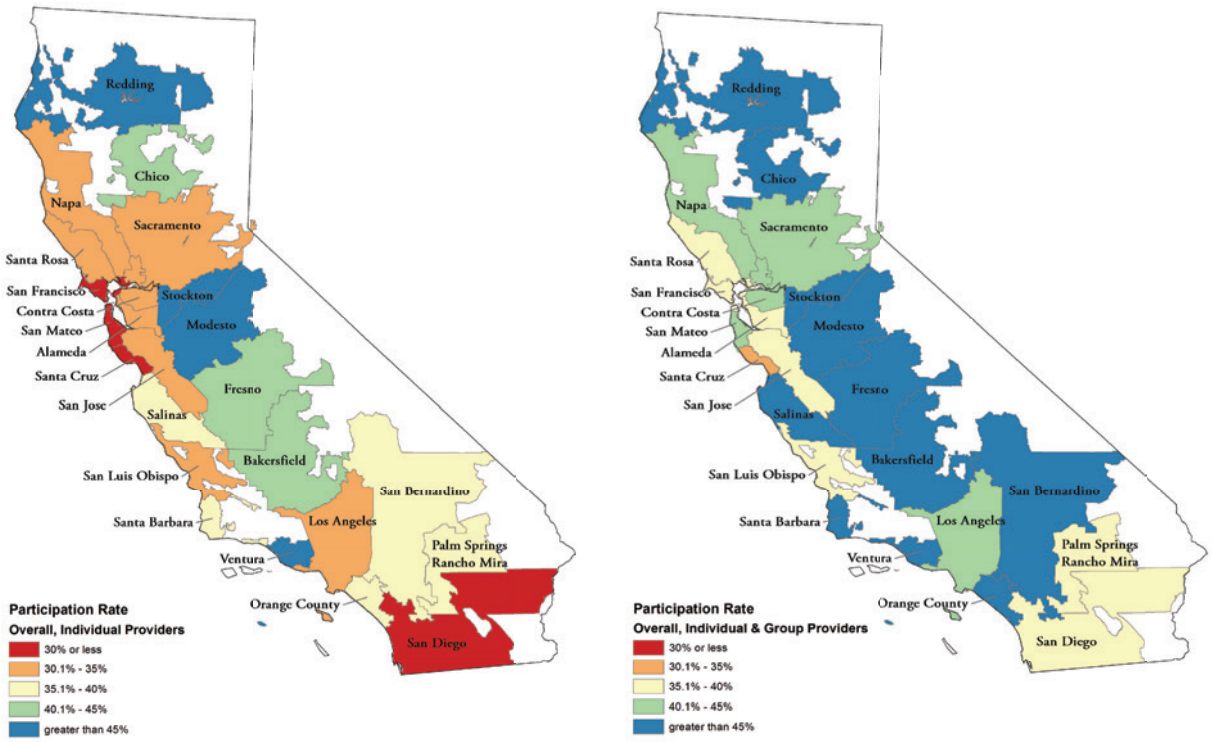
Other sensitivity analyses have patterns of participation that are similar to the main analysis but with higher participation rates (Appendix C, Figures C.1–C.3). These analyses were to use Medicare and SK&A data to define the potential universe of practicing physicians and to use any reported specialties, both of which are associated with higher participation rates compared with using NPPES as the universe or using the primary specialty only, respectively. The overall participation rates range from over a third to nearly half. Participation rates for common specialties serving WC patients, including orthopedic surgery, general practice, occupational medicine, and physical medicine and rehabilitation, ranged from nearly 80 percent to over 90 percent in these analyses. Physician participation rates were relatively low for plastic surgery, urology, family medicine, internal medicine, and psychiatry, often less than one-third. In these

scenarios, adding individual providers of groups that used a group identifier in the WCIS increased the participation rate, particularly among less common specialties.

As illustrated in Figure 7.2, there are 24 HRRs in California. The overall participation rate varied widely across geographic regions. When examining individual providers only, Modesto and Stockton HRRs had the highest participation rates, 57.8 percent and 47.8 percent, respectively, whereas San Diego and San Mateo had the lowest participation rates, 21.8 percent and 28.3 percent, respectively. If we assume that all the individual providers in a group that submitted a bill in 2012 served WC patients, the rates increase across the board by an average of 8.6 percentage points, but particularly in San Mateo, where the participation rate reaches 42.6 percent.

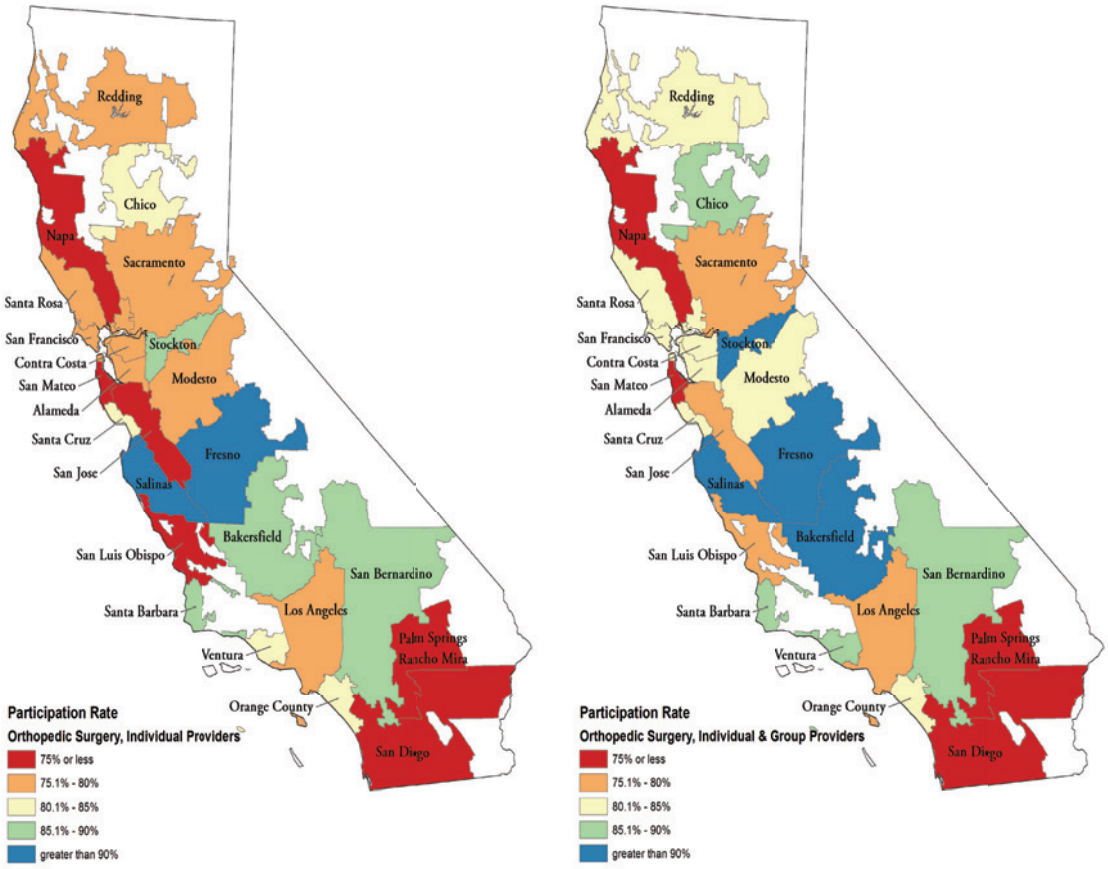
The participation rate in orthopedic surgery also varied widely across HRRs, ranging from about 59.8 percent in San Mateo to 92.5 percent in Salinas (Figure 7.3, left panel). Napa, Palm Springs/Rancho Mira, San Diego, and San Jose were among the HRRs with a participation rate of 75 percent or lower. Adding individual providers in a group increases the rates by an average of 2.9 percentage points (Figure 7.3, right panel), but the rates in Napa, San Mateo, Palm Springs/Rancho Mira, and San Diego remain below 75 percent.

Figure 7.2. Overall Physician Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data



NOTE: Blank space belongs to HRRs that include areas outside the State of California, such as those in Nevada or Arizona.

Figure 7.3. Orthopedic Surgery Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data

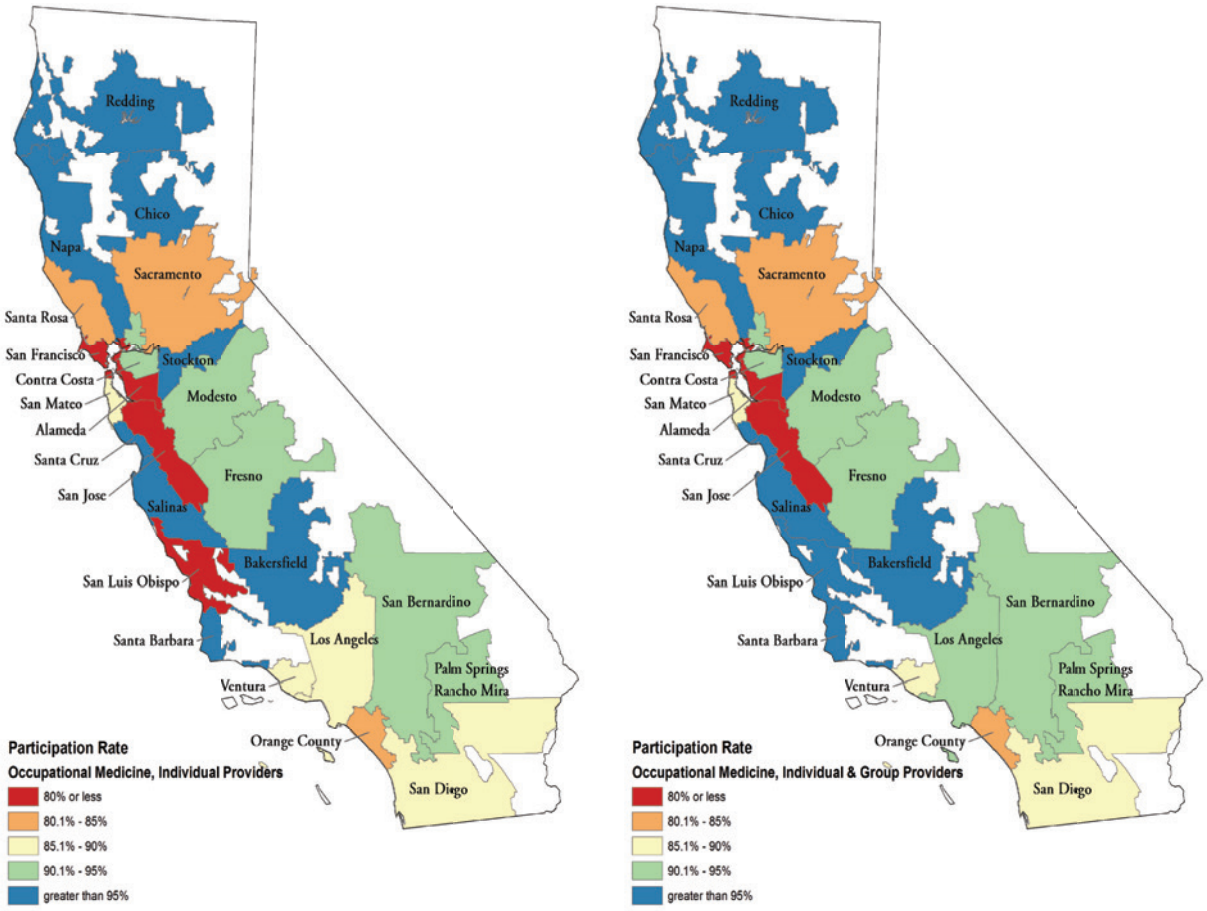


NOTE: Blank space belongs to HRRs that include areas outside the State of California such as those in Nevada or Arizona.

At slightly above 80 percent, the overall participation rate of occupational medicine was relatively high compared with other specialties (Figure 7.4), but it also had a large geographic variation. San Luis Obispo had a rate of 75 percent, and Bakersfield, Chico, Napa, Redding, Salinas, Santa Barbara, and Santa Cruz each had a rate of 100 percent. Adding individual providers in a group increases the participation rate by an average of 1.2 percentage points and does not change the patterns.

The patterns in geographic distribution are similar for other specialties (Appendix C, Figures C.4–C.9). In general, the participation rates were relatively high in Stockton, Modesto, and Fresno HRRs, but there were no HRRs that had consistently low rates across different specialties.

Figure 7.4. Occupational Medicine Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data



NOTE: Blank space belongs to HRRs that include areas outside the State of California such as those in Nevada or Arizona.

B. Comparison of Commercial Insurance Payments for Physicians with RBRVS

The purpose of this analysis was to determine average payment levels for commercial insurance plans by geographic location and type of service, and to compare them with what is paid under the new RBRVS fee schedule. The comparison is one measure of current payment adequacy for WC services. For our comparison, we use the payments for in-network services because the payments for out-of-network services are often much higher and do not necessarily reflect market rates.

Analytic Approach

Data

We used the 2011 WCIS data (see Chapter Two for a detailed description) to estimate maximum allowable amounts under the OMFS at the end of the transition to the RBRVS.[3] We used the 2012 FAIR Health repository of medical and dental health care charges, payment, and utilization data (FAIR Health data) to derive average allowed payments by commercial insurance plans.

FAIR Health is a national, independent not-for-profit corporation whose mission is to bring transparency to health care costs and health insurance information. FAIR Health uses its database of over 15 billion billed medical and dental services to power a free website (www.fairhealthconsumer.org) that enables consumers to estimate and plan their medical and dental expenditures. In addition to its consumer offerings, FAIR Health licenses data products to businesses, government agencies, health care providers, and researchers.

As of 2013, its database contains over 15 billion billed medical and dental procedures from 2002 to the present from over 70 data contributors covering 126 million plan members. Data contributors include health plans, insurance carriers, and third-party administrators. One FAIR Health module includes allowed amounts at the CPT code level by three-digit zip codes. The California allowed amounts module contains over 8 million billed procedures for a 12-month period. It represents over $475 million in billed charges and $225 million in allowed payments.

Methods

We first identified the basket of WC procedures by including only the procedure codes that accounted for at least 0.25 percent of the 2011 total WCIS allowed payments and used the 2014 Medicare physician fee schedule (MPFS) to assign three relative values (RVU) to each procedure: work, practice expense, and malpractice expense. Each RVU was multiplied by a statewide geographic practice cost index value, the summation of which was converted into dollars using a conversion factor. The conversion factor is 120 percent of the Medicare conversion factor for 2012. This conversion factor, updated for inflation, will determine the OMFS maximum allowable amounts beginning in 2017, when the RBRVS is fully implemented. In addition, we adjusted the total RBRVS allowed amount using Medicare ground rules. For example, we adjusted for multiple procedure discounts for surgical procedures

[3] Effective January 1, 2014, the OMFS is transitioning to an RBRVS-based fee schedule over a four-year period. At the end of the transition (2017), maximum allowable fees will be based on 120 percent of what would be payable under Medicare based on Medicare's 2012 conversion factor updated by the estimated increase in the Medicare Economic Index (MEI) and adjusted by a statewide geographic adjustment factor.

furnished on the same date for the same patient by the same physician. We excluded procedures from the market basket that do not have RVUs (e.g., are priced individually based on the physician's report) or are not covered by the Medicare Physician Fee Schedule. Detailed methodologies used to estimate utilization and RBRVS payment amounts are described in Wynn et al. (2013). We calculated an average RBRVS allowed amount for a procedure based on the average allowance in facility and nonfacility settings weighted by service volume for each setting. If a procedure has separate technical components and professional components, we calculated an average for the total procedure and for the professional component.

To construct average commercial health plan payments for the basket of procedures, we summarized by procedure code the average allowed amount for commercial claims in the FAIR Health data.[4] All WC and Medicare services were dropped so that the resulting average payments are for commercial employer health plans only. We also excluded line items with an allowed amount of zero, line items with a value that is larger or smaller than three standard deviations from the mean allowed amount for the same procedure in the same setting (facility or nonfacility), and services for which there were fewer than ten line items at the procedure/modifier level. Similar to the RBRVS calculations, we calculated a weighted average allowed amount across facility and nonfacility settings.

We then merged WCIS data with FAIR Health data by procedure code, modifier, and setting. We calculated an aggregate total allowed amount by type of service and by geographic location and categories of similar services based on the Berenson-Eggers Type of Service (BETOS) codes. We calculated the total allowed amount by multiplying the average allowed amount for each procedure by its WCIS service volume (after adjustments for Medicare ground rules) and summing the allowed amounts for all procedures within the category. We calculated the total allowed amounts for the RBRVS and commercial plans, respectively. We computed a payment ratio for each type of service or geographic location by dividing the total commercial allowed amount by the total RBRVS allowed amount. A similar approach was used to compute the overall payment ratio.

Results

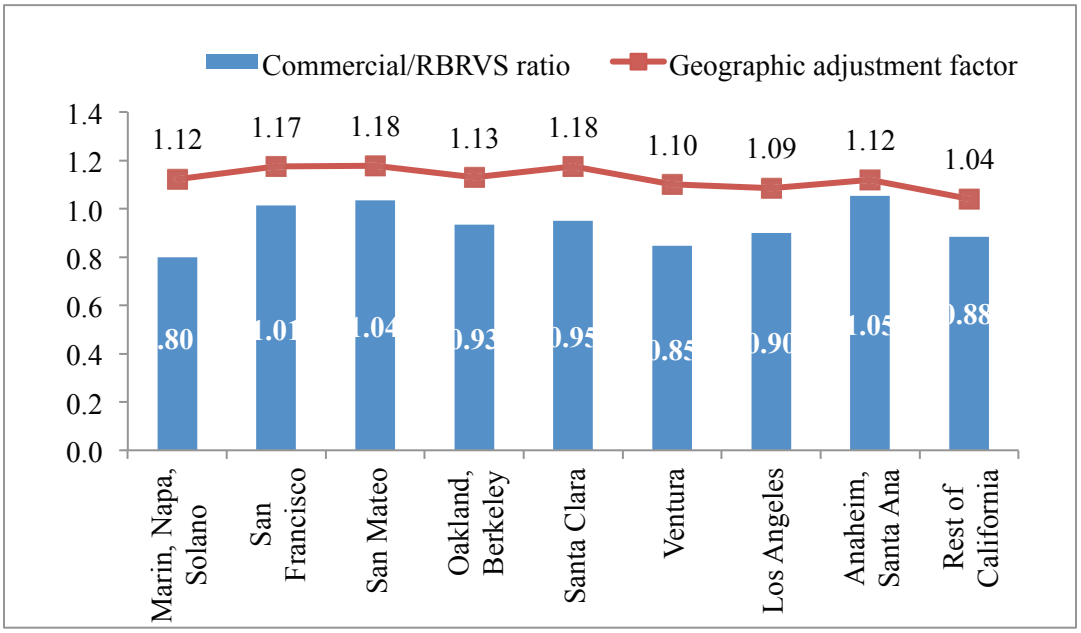
Overall, commercial insurance payments for physician services were 89.5 percent of RBRVS-based payments; or, RBRVS payments using 120 percent of the Medicare 2012 conversion factor were about 11.8 percent higher than commercial insurance payments. The OMFS uses a statewide geographic adjustment factor in its payment formula so that there is no

[4] Procedures with a modifier of 22, 27 (or TC), 36, 47, 48, 50, 51, 54, 55, 56, 62, 66, 80, 81, 82, 83, or AS were excluded because they received discounts and because discounting rules may differ between RBRVS and commercial insurance; including them in the analysis would distort the average allowed amount.

variation in payment levels across geographic areas. Figure 7.5 shows the commercial to RBRVS payment ratios by locality. There was moderate variation in payment differentials between commercial insurance payments and RBRVS across localities in California, with the lowest commercial payments relative to RBRVS (80 percent) in the Marin/Napa/Solano area and the highest (105 percent) in the Anaheim/Santa Ana area. The pattern in payment ratios across localities is similar to that of Medicare geographic adjustments for physician practice costs, suggesting that both commercial insurance payments and Medicare geographic adjustment factors reflect differential input prices for physician services.

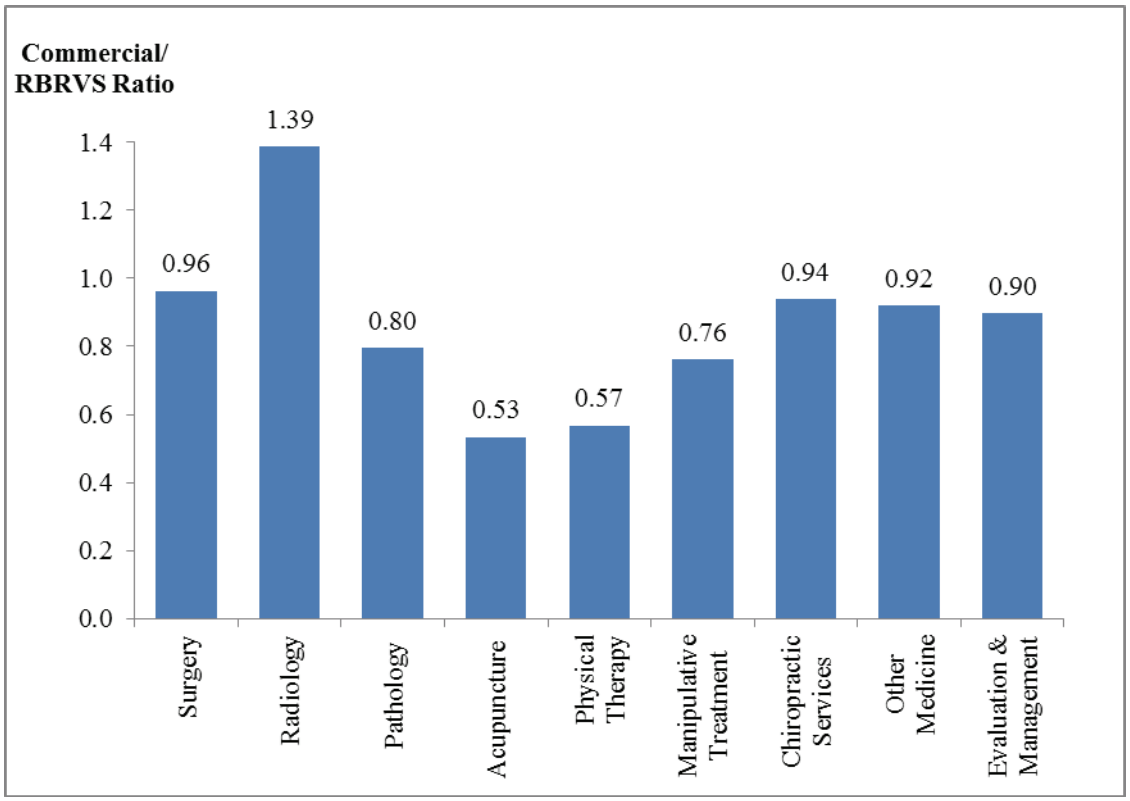
There was also large variation in the payment ratios across type of service (Figure 7.6). Commercial insurance payments for E&M, surgery, and chiropractic services are largely in line with RBRVS-based payments, with a ratio ranging from 0.90 to 0.96. However, commercial payments for radiologic services were nearly 40 percent higher than RBRVS payments, whereas payments for pathology and manipulative treatment services were 20 percent less. Commercial insurance paid only about half of what the RBRVS pays for acupuncture and physical therapy.

Figure 7.5. Commercial/RBRVS Payment Ratio by Locality



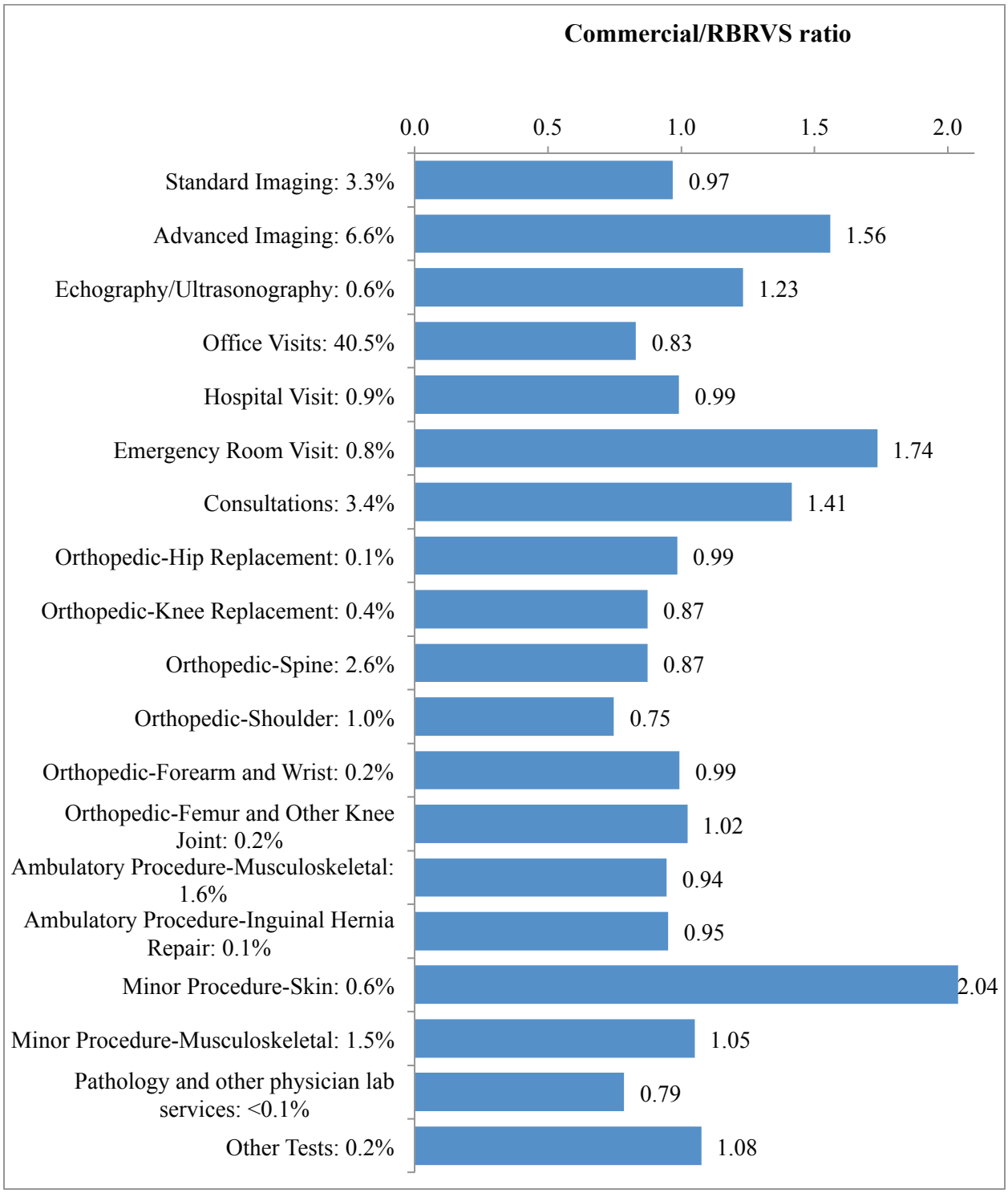
NOTE: Based on 2012 Fair Health data. The overall ratio for 2012 is 0.8945.

Figure 7.6. Commercial/RBRVS Payment Ratio by Type of Service



As shown in Figure 7.7, when examining payment differentials by BETOS codes, compared with RBRVS, commercial insurance paid over 50 percent more for advanced imaging services, 20 percent more for echography/ultrasonography, 70 percent more for emergency physician care, and 40 percent more for consultation services (which are payable the same as E&M visits under RBRVS). Commercial payments for minor skin procedures were more than twice those of RBRVS. Payments for standard imaging, hospital visits, and most of orthopedic services (hip replacement, forearm and wrist, and femur and other knee joints) were similar between the two systems. However, commercial insurance paid nearly 20 percent less for office visits, 10 percent less for knee replacement and spinal surgeries, and 25 percent less for shoulder surgeries. Commercial payments for pathology services are about 20 percent lower than those of RBRVS. Overall, the services shown in Figure 7.7 represent 64.8 percent of all WC physician expenditures. Of note, office visits account for the largest proportion of all WC physician expenditures, 40.5 percent. All other services represent less than 7 percent of physician expenditures.

Figure 7.7. Commercial/RBRVS Payment Ratio by BETOS Code



NOTE: The percentage indicates the proportion of the total physician expenditures each BETOS code represents. The BETOS codes shown in the figure account for 65 percent of all physician expenditures.

C. Pre-RBRVS Discounting for Physician Services

Using the 2011 data, we measured the average discount off the OMFS allowed amount by computing the proportion of the OMFS allowed amount that was actually paid. Since there are no co-payments, coinsurances, or deductibles for WC patients, the proportion reflects the discounts WC insurers received. Data limitations precluded us from calculating a discount rate specific to services that were furnished by physicians participating in an MPN. We found that we were unable to identify their services (or other services furnished under contract) reliably, and as a result, we were able to compute only an overall discount rate.

Analytic Approach

Data

We used the 2011 WCIS data to measure the pre-RBRVS discounting for physician services. For this analysis, we focused on outpatient nonfacility physician services only. We did not include bills for facility services.

Methods

Using the line items for physician bills, we applied several exclusion criteria. All line items with zero actual payments were excluded so that they would not distort the average or total actual payments. To measure actual payments per unit of service, procedures with payments that were discounted by the OMFS were dropped (e.g., multiple surgical procedures or physical therapy procedures, or procedures with specific modifiers that report atypical services).[5] Payment outliers were identified as the line items with a total payment that is larger or smaller than three standard deviations from the mean payment amount for the same procedure.

We manually identified procedures that the OMFS allows to be billed with multiple units of services as one line item and computed the total actual payments and total allowed amounts by multiplying the unit allowance by the number of units reported for the line item. We excluded all anesthesia service line items because we were not able to quantify the number of units for these services due to data limitations.

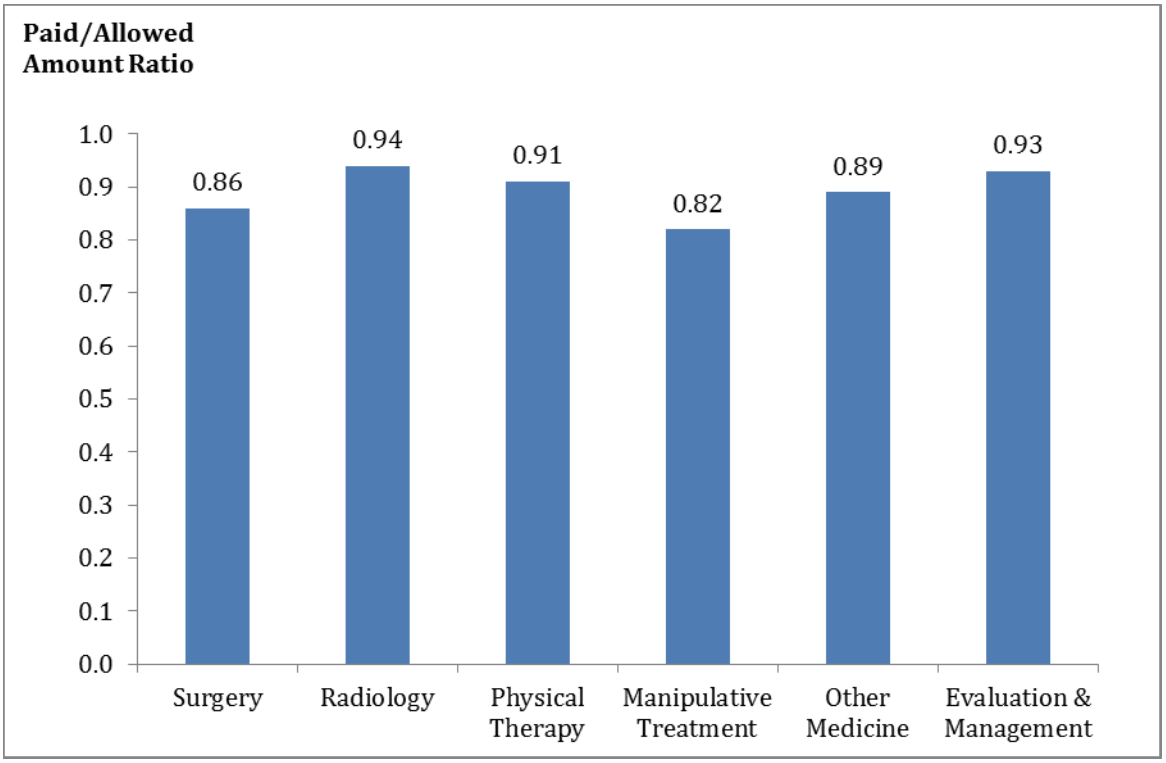
For each procedure, type of service, or medical specialty, we calculated an overall average discounted fee level by dividing the total actual payments by the total allowed amount.

[5] Specifically, we dropped all procedures with a modifier of 22, 27 (or TC), 36, 47, 48, 50, 51, 54, 55, 56, 62, 66, 80, 81, 82, 83, or AS.

Results

Prior to the implementation of RBRVS, actual payments were, on average, about 89.0 percent of allowed amounts in 2011. The discounting did not vary much across common types of services (Figure 7.8). Discounts for surgery and manipulative treatments were slightly larger, 14 percent and 18 percent off allowed amounts, respectively, than those for other types of services, which typically had a discount of less than 10 percent.

Figure 7.8. OMFS Overall Discounted Fee Levels by Type of Service



NOTE: Based on 2011 WCIS data. The overall discounting for 2011 is 0.8897.

Figure 7.9 shows that the discounting was about 10 percent off allowed amounts for a majority of specialties. Compared with other specialties, chiropractic services had a larger average discount (20 percent).

The largest total payments in 2011 were for extensive office visits for an established patient (99214), which accounted $84.2 million or 11.5 percent of total 2011 payments for physician serviced (Table 7.3). Among the top 20 procedures with largest total payments, the discount (1- ratio of paid to allowed amount) was typically 10 percent or less. But psychological testing (96100) received a larger discount (17 percent) than other high-payment procedures.

Figure 7.9. OMFS Discounting by Provider Specialty

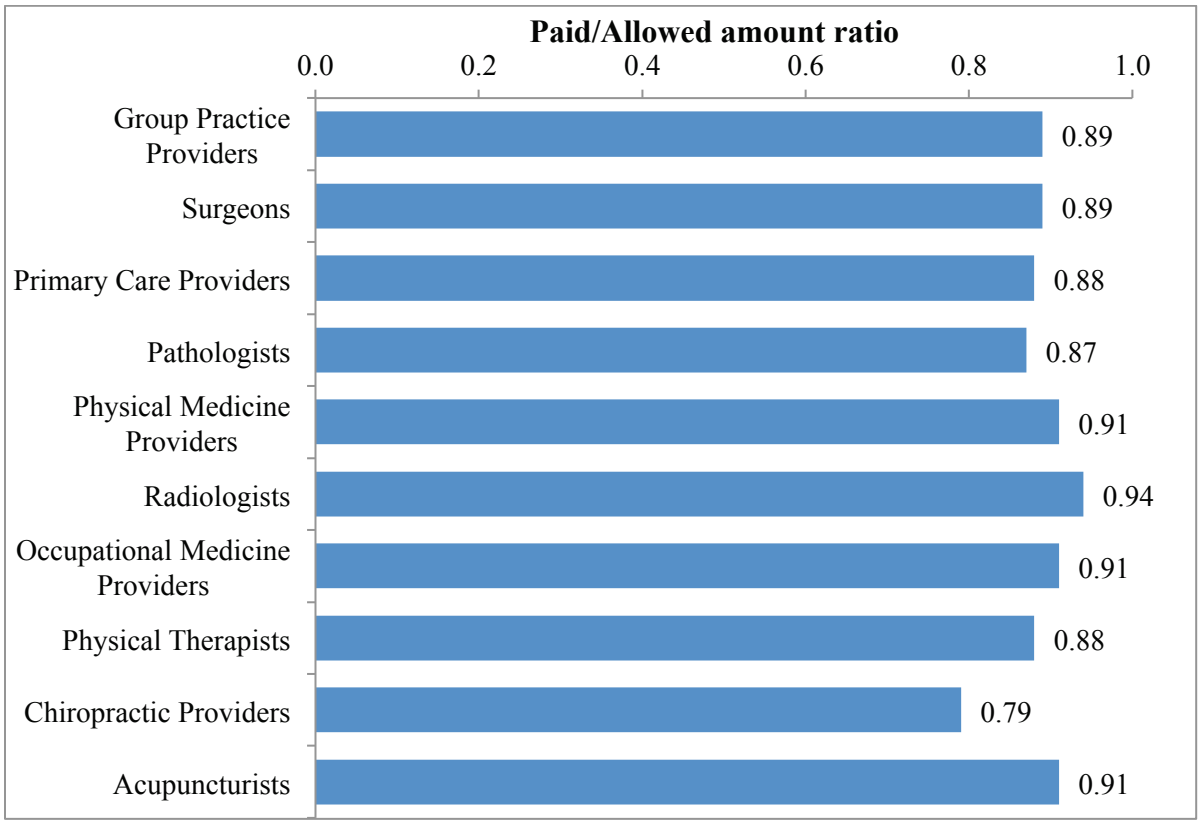


Table 7.3. OMFS Discounting by Top 20 Procedures with Highest Total Spending

CPT Code	Code Description	Total Paid Amount ($)	Total Allowed Amount ($)	Percentage of Total Physician Expenditure	Paid/Allowed Amount Ratio
99214	Office visit, established patient, 25 minutes	84,176,069	89,011,262	11.5	0.95
99213	Office visit, established patient, 15 minutes	41,694,496	43,911,191	5.7	0.95
97250	Myofascial release and soft tissue mobilization	33,473,730	36,804,562	4.6	0.91
99215	Office visit, established patient, 40 minutes	28,500,507	30,884,344	3.9	0.92
99204	Office visit, new patient, 45 minutes	17,463,002	18,558,117	2.4	0.94
99358	Prolonged E&M, first 60 minutes	17,444,432	18,582,933	2.4	0.94
73221	MRI, upper extremity, no contrast	15,788,956	16,531,729	2.2	0.96
99081	Required reports	15,770,170	16,926,208	2.2	0.93
72148	MRI, lumbar, no contrast	13,883,295	14,573,607	1.9	0.95
95904	Nerve conduction, sensory	13,371,799	14,533,493	1.8	0.92

Table 7.3—Continued

CPT Code	Code Description	Total Paid Amount ($)	Total Allowed Amount ($)	Percentage of Total Physician Expenditure	Paid/Allowed Amount Ratio
95903	Nerve conduction, motor	12,297,860	13,479,641	1.7	0.91
73721	MRI, lower extremity, no contrast	11,710,673	12,515,787	1.6	0.94
99245	Consultation, 80 minutes	11,299,523	12,572,055	1.5	0.90
97110	Therapeutic procedure, 15 minutes	10,636,488	11,633,164	1.5	0.91
99203	Office visit, new patient, 30 minutes	9,696,549	10,361,801	1.3	0.94
99244	Consultation, 60 minutes	9,351,231	9,897,774	1.3	0.94
96100	Psychological testing	9,002,011	10,850,695	1.2	0.83
90844	Psychotherapy	8,608,065	9,036,564	1.2	0.95
97801	Electro-acupuncture	8,577,585	9,391,585	1.2	0.91
72141	MRI, cervical, no contrast	7,691,743	8,092,284	1.1	0.95

Limitations

Provider Participation Rates

There are limitations in our estimates of both the number of physicians serving WC patients and the number of physicians who potentially could serve WC patients. Because the WCIS data are incomplete, the number of physicians serving WC patients may be understated. Further, our estimates are influenced by how we addressed billings under a group NPI, specialty designations, and multiple geographic practice locations. The rates may also be affected by using 2012 WCIS counts in the numerator and 2014 NPPES data in the denominator. Our NPPES counts of the number of physicians who potentially might serve WC patients are likely overstated. Although we excluded the providers who explicitly recorded a deactivation date and those in specialties who are unlikely to serve WC patients, the NPPES may overestimate the universe because the provider information includes physicians who may not be active in civilian patient care (for example, federally employed physicians) or may not bill directly for their services (for example, residents in graduate medical education programs who work under the supervision of a teaching physician). The counts are also affected by how we counted physicians who reported multiple California practice locations or specialties. Further, other studies have shown that the NPPES is not updated timely to reflect changes in physician practice locations. Some physicians who are practicing in California are listed in the NPPES as practicing elsewhere and some who are listed in the NPPES as practicing in California are actually practicing elsewhere. Our approach assumes that while the practice locations of individual physicians may not be current, the inaccuracies are in both directions and balance each other out in the aggregate counts.

When interpreting physician participation rates, a small universe of potential physicians could make some rates unreliable. In selecting the commonly reported specialties, we required at

least 100 physicians in the NPPES for the specialty. But it remains an issue when examining geographic variation in participation rates for a specific specialty. For example, the denominator for orthopedic surgery or occupational medicine in a number of HRRs was smaller than 50.

One of the challenges in the analysis was to assign a specialty to a physician. A physician may report multiple specialties in the WCIS. For example, a physician reported general surgery as a specialty on one bill but orthopedic surgery on another. Nearly half of the physicians reported more than one specialty; we used the most frequently reported specialty as the primary specialty. In the NPPES, a physician typically designates a primary specialty. In examining specialty participation rates, should a physician be counted only once based on her or his primary specialty reported in the NPPES (or the WCIS) or multiple times based on the specialties reported on WC bills? In other words, should the physician who reported orthopedic surgery as her or his specialty be counted only once as an orthopedic surgeon or also be counted as providing access to general surgery? Our sensitivity analyses showed that including any reported specialty was associated with higher participation rates. There are no perfect solutions, but policymakers will have to take this into account when measuring access to care based on physician participation rates.

Our estimates were affected by the way the market is organized, in particular the formation of provider networks such as MPNs and the participation of WC providers in these networks, and we were not able to tease out these impacts and generate more accurate estimates of participation rates. However, the formation of provider networks such as MPNs may be more likely to include providers with high quality of care and to exclude those who are low performers. Such arrangements may improve the overall quality of care for the WC population. In addition, provider networks would enable network sponsors such as employers to align incentives and control WC medical care costs.

Comparison with Group Health Payments

In the analysis, we used in-network commercial payments instead of out-of-network payments. This is because commercial payments are determined by local market conditions—the supply of and demand for medical services—and in-network prices reflect the market power of stakeholders. Out-of-network prices are typically higher and do not reflect the local market conditions. Given that a WC provider is typically part of a network, we used in-network prices for our purpose.

Our analysis is limited by the fact that FAIR Health data are not necessarily representative of the state. FAIR Health data are collected from participating insurers, whose prices may not reflect the average payment of the selected basket of services in California. The payment ratios could be either over- or underestimated.

Fee Discounting

Our analysis of fee discounting predates the implementation of the RBRVS and serves as a baseline rather than an estimate of current fee discounting levels. Because we were not able to reliably identify MPNs or contract care in the WCIS data, we derived an overall ratio of payments to OMFS allowances that includes both services that were paid at the allowance level and services that were paid at a discounted rate.

Key Findings

Provider Participation Rates

We found that about one-quarter (individual providers) to one-third (individual and group providers) of physicians participated in WC in 2012. Among common medical specialties such as orthopedic surgery, general practice, occupational medicine, and physical medicine and rehabilitation, more than two-thirds of physicians served WC patients in 2012. The participation rates were low for plastic surgery, urology, family medicine, internal medicine, and psychiatry, and participation rates varied widely across HRRs.

Comparison with Group Health Payment Levels

Overall, we found that commercial insurance payments were about 90 percent of RBRVS-based payments. However, there was significant variation in payment ratios across type of service and BETOS categories, with the commercial payments for radiologic services (in particular advanced imaging services), emergency care, and consultation services being 40 percent or higher than RBRVS.

We found geographic variation in commercial-RBRVS payment ratios that was in line with that of Medicare geographic adjustment factors. In other words, relative to RBRVS payments that do not adjust for geographic price variation, both commercial payments and Medicare adjustment factors reflect input prices that vary across geographic areas.

Fee Discounting

We examined retrospectively the potential market power of WC provider networks as reflected in payment discounting prior to the implementation of RBRVS. We found that most services received a discount of 10 percent and that the discount varied only slightly across service types, provider specialties, and high-volume procedures.

Discussion

Provider Participation Rates for WC Patients

The true estimates of participation rates probably lie between the rates based on individual providers and those based on both individual and group providers. Many providers submitted a bill using a group NPI in the WCIS. We used address matching to identify individual providers within those groups and assumed all of them served WC patients. Such an approach may overestimate participation rates because some physicians in the group may not serve WC patients. However, excluding these group providers likely underestimates participation rates.

Our results are robust to several sensitivity analyses. The patterns of participation across specialties in the sensitivity analyses are very similar to those in the main analysis, although participation rates were generally higher. Using Medicare and SK&A providers as the universe of active community providers increases the calculated participation rates because the universe of potential physicians is more narrowly defined.

Provider and service availability, as measured by physician participation rate, is an important dimension of patient access to necessary services, but should be used in conjunction with other measures. Physician participation rates are determined by both physicians' willingness to serve WC patients and their inclusion in the MPNs by employers and/or insurers. Ideally, the numerator of physician participation rates should include all physicians who are willing to provide services to WC patients. Our analysis included only physicians who actually submitted a bill captured in the WCIS. There may be physicians who were part of an MPN but never actually served a WC patient and were therefore not included in the analysis. Physician participation rates as presented in this analysis should be used in conjunction with the rates of participation in MPNs. Further analyses are warranted to understand the implications of MPN participation on overall physician participation rates.

Comparison of Commercial Insurance Payments for Physicians with RBRVS Payments

Physician participation rates may also be affected by payment levels. At the end of the transition to the RBRVS, OMFS allowances will be 120 percent of Medicare payment rates. One question is whether these rates will also be competitive with the rates paid by commercial insurers. Our results suggest that the overall allowances will be competitive but that some services, such as advanced imaging and consultations, warrant monitoring to ensure that access issues do not arise.

Our results indicate that the geographic variation seen in the commercial rates more closely mirrors the geographic adjustment factor used by the Medicare program than the statewide geographic adjustment factor adopted by the OMFS. Input prices are one of the key drivers of commercial insurance payments, but there are other factors as well, such as the market power of the physician groups in the community. Locality-specific adjustment factors could align the

payments with local market conditions better than a statewide adjustment factor and could avoid either overpayments or underpayments relative to the expenses physicians face in providing services. As the RBRVS is implemented, it will be important to monitor whether there are access issues specific to high-cost areas, such as San Francisco and San Mateo Counties.

Pre-RBRVS Discounting for Physician Services

As part of SB 863 reform, a new RBRVS fee schedule has been established for provider services. Our analysis could serve as background and a baseline comparison for future studies on the impact of SB 863 on fee discounting. The implementation of SB 863 has also strengthened the monitoring of MPNs. These changes could affect the market power of MPNs, the supply of WC medical services, the payment level, and ultimately WC patients' access to and outcome of care. We will explore this topic further as part of our evaluation of the SB 863 medical treatment provisions.

8. Medical-Legal Services

Overview

Chapter Four examines trends in the utilization and cost of medical services provided to injured workers. Another type of medical expense—medical-legal expenses—is incurred when a medical expert evaluates an injured worker's condition to determine entitlement to WC benefits but does not provide medical treatment. This chapter addresses three related research questions regarding medical-legal expenses. First, what are the trends in the number and type of medical-legal evaluations and spending? Second, which specialties deliver these services, and how is this changing over time? Third, what other services, if any, are delivered by the same providers and to the same injured workers that are related to the medical-legal services? We analyze 2007–2012 WCIS data to answer these questions. A separate report (forthcoming) examines medical-legal fee schedule issues and the implications of the SB 863 provisions affecting medical-legal examinations.

Medical-Legal Services

The term "medical-legal services" refers to disability evaluations and expert testimony by qualified medical examiners (QMEs) and agreed medical examiners (AMEs). The services are provided to evaluate the patient's condition for purposes of determining what WC benefits he or she will receive when there is a disagreement over the primary treating physician's opinion on work-related issues. QMEs and AMEs do not provide medical treatment but may order diagnostic tests needed to complete an evaluation. The types of issues that are evaluated include

- whether the injury is work related
- whether the injured worker is able to return to work
- whether the injured worker's condition is permanent and stationary and, if so:
  - what the worker's permanent disability rating is
  - what the worker's likely future medical needs will be
  - whether the patient's disability is new or should be apportioned among multiple employers.

Prior to July 1, 2013, the evaluations could also be used to assess the medical necessity of medical treatments when there was a dispute between the treating physician and the claims

administrator.[1] However, if the only issues involved medical necessity, the injured worker could have requested an expedited administrative hearing on the medical necessity dispute. Therefore, it is likely that most medical-legal evaluations during 2007–2012 involved at least one work-related issue and may have also involved one or more medical necessity disputes.

QMEs are licensed allopathic or osteopathic physicians, chiropractors, psychologists, dentists, optometrists, podiatrists, or acupuncturists who are certified by DWC to perform medical-legal evaluations. Either the injured worker or the claims administrator may request that DWC assign three QMEs to a panel in a designated specialty. An unrepresented injured worker may select one of the individuals listed on the QME panel. For represented workers, the defense and applicant's attorneys may each remove one individual from the QME panel; the remaining individual is selected as the QME for the injured worker. Once a QME is selected, most disputes must go to this individual unless there are multiple injuries that require evaluations by different specialties. Alternatively, if a worker is represented, the applicant's attorney and the claims administrator may agree on an evaluator. The AME need not be certified by DWC to perform medical-legal evaluations. Table 8.1 lists the fee schedule codes that are used in the California WC program to describe and pay for medical-legal evaluations and testimony. Two codes—ML102 and ML103—are paid on a per-evaluation basis. Providers must document at least three complexity factors (outlined in the fee schedule) to justify payment for ML103. The remaining four codes are billed in 15-minute increments. Table 8.1 lists the maximum allowable amounts

Table 8.1. California WC Medical-Legal Codes

Code	Description	Payment (RVUs)	Unit of Service
ML101	Follow-up medical-legal evaluation	5	15 minutes
ML102	Basic comprehensive medical-legal evaluation	50	1 evaluation
ML103	Complex comprehensive medical-legal evaluation	75	1 evaluation
ML104	Comprehensive medical-legal evaluation involving extraordinary circumstances	5	15 minutes
ML105	Fees for medical-legal testimony	5	15 minutes
ML106	Fees for supplemental medical-legal evaluations	5	15 minutes

NOTE: Medical-legal 100 is used to describe a missed appointment for a comprehensive or follow-up medical-legal evaluation. The code is intended for communication purposes only and does not imply that compensation is necessarily owed.

[1] Effective January 1, 2013, for all injuries occurring on or after that date and effective for all disputes occurring on or after July 1, 2013, regardless of date of injury, an independent medical review process is used to resolve medical necessity disputes.

for each medical-legal code expressed in RVUs. The current allowable amount is $12.50 per RVU. The time-based codes all value the physician's service at $62.50 per 15 minutes ($12.50 × 5), or $250 per hour. Providers may bill a medical-legal code with one or more modifiers, some of which affect payments. See Table 8.2 for a summary of these modifiers and their effects. For example, the fee schedule maximum allowable amount for an evaluation performed by an AME is 25 percent higher than the allowable amount when a QME or primary treating physician performs the evaluation. The effect of modifiers 93 and 94 on payments is additive—that is, a claim line with both modifiers is paid at 135 percent of the base rate.

Table 8.2. Medical-Legal Fee Schedule Modifiers

Modifier	Description
-92	Indicates that the evaluation was performed by the primary treating physician. No impact on payment.
-93	Indicates that an interpreter was used during the evaluation. Increases payment for medical-legal 102 or medical-legal 103 by 10%.
-94	Indicates that an Agreed Medical Examiner performed the service. Increases payment by 25%.
-95	Indicates that a Qualified Medical Examiner performed the service. No impact on payment.

Management organizations provide administrative and support services to a significant percentage of physicians performing medical-legal examinations. Typically, these organizations provide office space, scheduling, and transcription services; obtain the medical records pertinent to the examination; submit the required medical-legal reports; bill for the services; and pay the physician performing the evaluation. The physicians under contract to these organizations are listed as individuals on DWC's listing of qualified QMEs, but the practice locations and phone numbers are those supported by the management company. At least some management organizations do not require an exclusive contract, so the listings for an individual (limited to ten locations by SB 863) may be associated with more than one management organization and/or the location of the individual's private practice.

Data and Methods

We use the WCIS data for 2007–2012 in our analyses. Because most services are reported in 15-minute time increments, we could not use the number of reported units as a measure of the number of evaluations. Instead, we defined an evaluation as a paid line item for one of the medical-legal codes described above. We used the number of units reported for the time-based codes to explore changes in the time required to perform evaluations. In doing so, we identified outliers in the reported units and developed an algorithm to clean the data based on the payments and the OMFS allowances per 15 minutes for the time-based codes. We used the paid amounts reported for the line item as the amount paid for an evaluation. This amount should

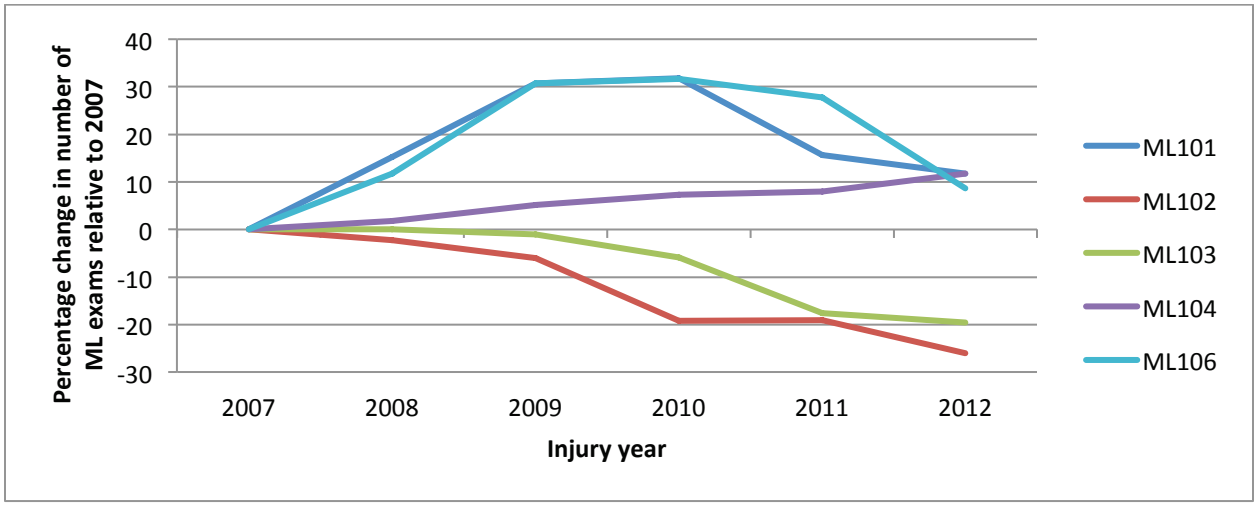
include any premiums or discounts that the claims administrator and the evaluator have agreed on and any additional payments made for AME examinations and services provided with an interpreter.

We grouped medical-legal services billed under a single provider identification number. Our objective was to assess the percentage of physicians furnishing services to injured workers who are performing medical-legal services. We found that we were unable to do so using the WCIS data because a substantial proportion of medical-legal services are billed under an organizational identification number rather than the unique NPI assigned to an individual physician.[2] Instead, we used information in advertising brochures and on websites to identify the largest medical-legal management organizations and to compare their billing patterns with those of other providers performing medical-legal evaluations.

Utilization Trends

The billing patterns for medical-legal services vary considerably from 2007 to 2012. Figure 8.1 illustrates net changes in the number of evaluations (line item billed) for each medical-legal code relative to 2007. Compared with 2007, initial evaluations fell 8.4 percent in 2012, but medical-legal 104 increased 11.5 percent (Table 8.3). Follow-up or supplemental

Figure 8.1. Change in Number of Evaluations Relative to 2007, by Medical-Legal Code



[2] Prior to SB 863, there was no limit on the number of locations for which an individual could be listed as a QME. Concerns over the multiple office listings by QMEs under contract with management organizations led to the limit of ten office locations.

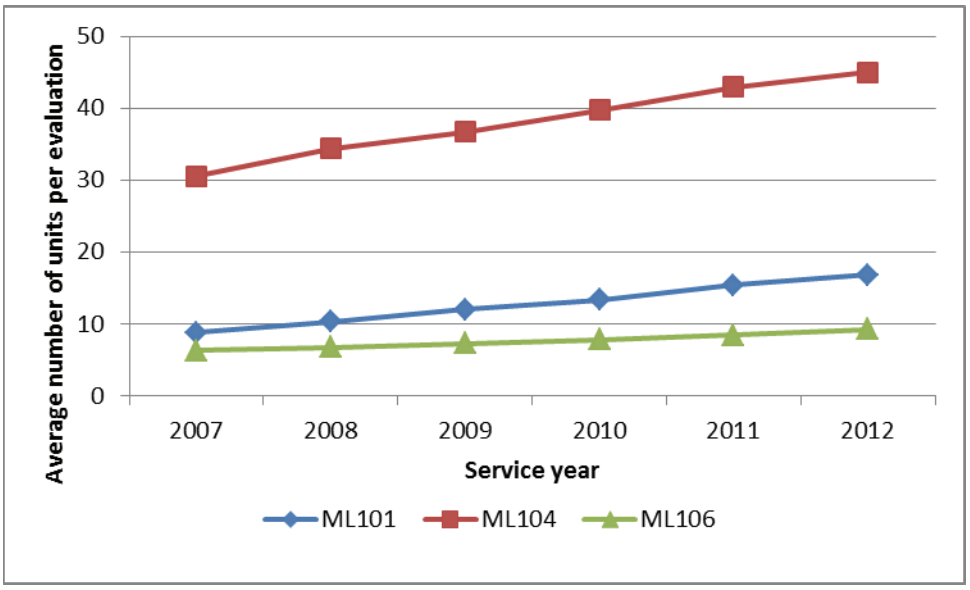
Table 8.3. Number of Evaluations/Expert Testimony Services by Medical-Legal Code

	Service Year						Percentage Change
	2007	2008	2009	2010	2011	2012	2007–2012
Initial Examinations							
ML102	45,263	44,247	42,523	36,548	36,616	33,334	–26.4
ML103	26,946	26,967	26,658	25,365	22,191	21,611	–19.8
ML104	56,416	57,447	59,336	60,548	60,875	62,921	11.5
Subtotal	128,625	128,661	128,517	122,461	119,682	117,866	–8.4
Follow-Up or Supplemental Examinations							
ML101	10,387	11,968	13,586	13,704	12,015	11,587	11.6
ML106	54,902	57,118	65,232	67,425	69,131	64,960	18.3
Subtotal	65,289	69,086	78,818	81,129	81,146	76,547	17.2
Expert Testimony							
ML105	1,209	1,351	1,577	1,587	1,532	1,302	7.7

examinations increased 17.2 percent overall. The number of ML101 evaluations increased 30 percent from 2007 to 2009 but declined beginning in 2011. Providers billed for about 20 percent fewer basic and complex initial evaluations in 2012 than in 2007, but billed between 11.5 and 18.0 percent more medical-legal evaluations reported in 15-minute increments (ML101, ML104, and ML106).

We also analyzed trends in the number of units billed by providers after adjusting the WCIS unit counts to address outliers (see Appendix C). The distinction between the number of evaluations and the number of units is particularly important for those medical-legal codes that are billed in 15-minute increments. Changes in average units per evaluation are reported for these codes in Figure 8.2. For example, the average number of units billed for ML104 increased from 30.6 to 45.0, which represents an increase of 216 minutes or more than 3.5 hours in the average length of time reported to conduct an examination.

Figure 8.2. Average Number of Units per Evaluation, by Medical-Legal Code



In Table 8.4, we summarize the aggregate number of evaluations, aggregate payments, and the average payment per evaluation from 2007 to 2012. Across all medical-legal codes, aggregate payments increased 46 percent over the 2007–2012 period. Because there were no fee schedule changes over this period (the last revision for inflation was effective July 2006), the changes in total payments are attributable to several factors: changes in the number and type of evaluations, changes in the average number of units per evaluation, and changes in the proportion of evaluations that are performed by AMEs and/or that involve interpreters. We estimate that the change in the number and type of evaluations increased expenses for medical-legal examinations 3 percent in 2012 relative to 2007 and that the remaining increase in medical-legal spending is largely attributable to the increase in the number of units reported for the time-based examinations (Table 8.5). Other factors, such as changes in negotiated fee schedule levels, may have offset to some extent the full effect of the changes in billed units.

Table 8.4. Changes in Total Medical-Legal Initial and Subsequent Evaluations by Volume and Payments, Service Years 2007–2012

	2007	2008	2009	2010	2011	2012	Percentage Change 2007–2012
Initial Evaluations							
Total number of evaluations	128,625	128,661	128,517	122,461	119,682	117,866	–8.4
Total payments ($mils)	176.7	194.6	209.5	221.7	233.0	244.5	38.4
Average payment ($)	1,374	1,513	1,630	1,810	1,947	2,074	51.0
Annual change in average payment (%)		10.1	7.8	11.1	7.5	6.5	
Subsequent Evaluations							
Total number of evaluations	65,289	69,086	78,818	81,129	81,146	76,547	17.2
Total payments ($mils)	29.5	35.3	44.5	50.0	54.4	55.8	89.0
Average payment ($)	453	512	565	616	670	730	61.2
Annual change in average payment (%)		13.0	10.5	9.1	8.7	8.9	
All Evaluations							
Total number of evaluations	193,914	197,747	207,335	203,590	200,828	194,413	0.3
Total payments ($mils)	206.2	230.0	254.1	271.7	287.4	300.3	45.6
Average payment ($)	1,063	1,163	1,225	1,335	1,431	1,545	45.3
Annual change in average payment (%)		9.4	5.4	8.9	7.2	7.9	
Percentage AME		44.0	53.3	61.7	64.5	57.9	

Table 8.5. Percentage Change in Factors Affecting Medical-Legal Spending Relative to 2007

	Service Year				
	2008	2009	2010	2011	2012
Volume	2	5	4	3	3
Units	9	17	29	38	43
AME	2	3	3	4	3
Interpreter	0	0	0	0	0
Combined impact	13	26	39	47	51
Other	–1	–3	–6	–6	–4
Total change in payments	12	23	32	39	46

Use and Timing of Medical-Legal Services

Figure 8.3 displays the percentage of claims by injury year that have a medical-legal code in different time periods following the date of injury. Providers are most likely to bill for medical-legal services between 12 and 24 months after injury. This pattern has remained relatively constant across injury years. The percentage of claims with medical-legal codes in the first six months is generally comparable across injury years (2.2–2.6 percent). For the later time periods, there is a steady increase in the percentage of claims with medical-legal codes over the injury years. Approximately 5.3 percent of 2010 injuries had at least one medical-legal bill between 12 and 18 months postinjury, and 5.1 percent had at least one medical-legal service in the 18- to 24-month period. In the two subsequent six-month periods, 4.3 percent and 3.2 percent of 2010 injuries had at least one medical-legal bill compared with 3.3 percent and 2.6 percent for injuries occurring in 2007. For injuries occurring in 2011, the percentage of claims with medical-legal codes through month 18 is comparable to injury year 2010 (data not shown). More recent data are needed to determine whether the percentages remain comparable for subsequent periods.

Figure 8.4 shows the trend by injury year in the number of medical-legal evaluations per 100 claims. Relative to injury year 2007, the average number of medical-legal evaluations per 100 claims with 2010 injuries was 23 percent higher 12 months after injury and 30 percent higher 24 months after injury. The number of medical-legal evaluations reported in the WCIS

Figure 8.3. Percentage of Claims by Injury Year with Medical-Legal Services by Period of Time from Date of Injury

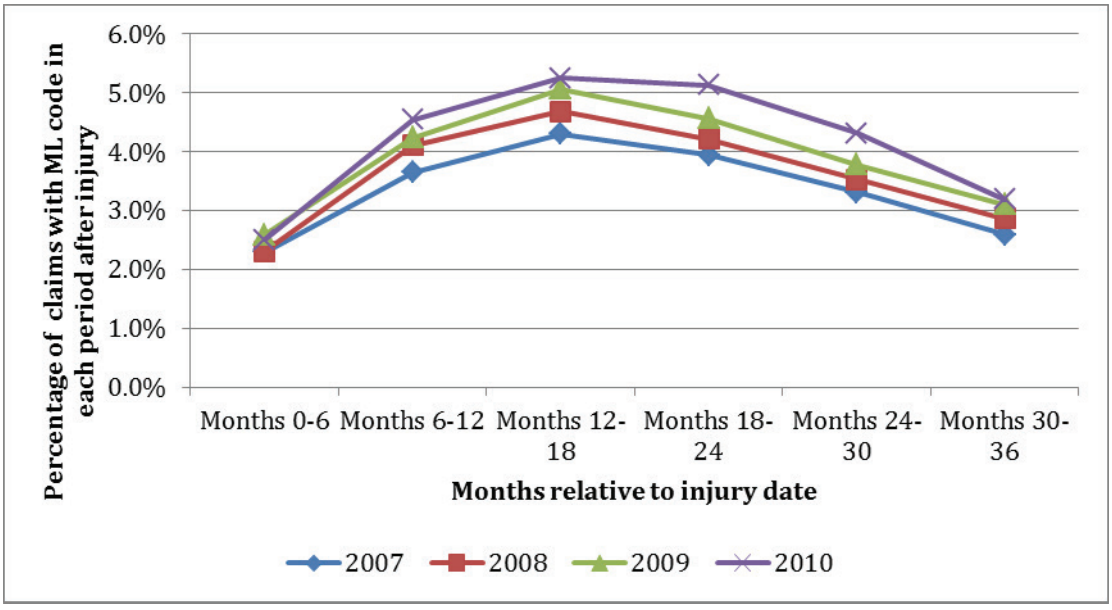
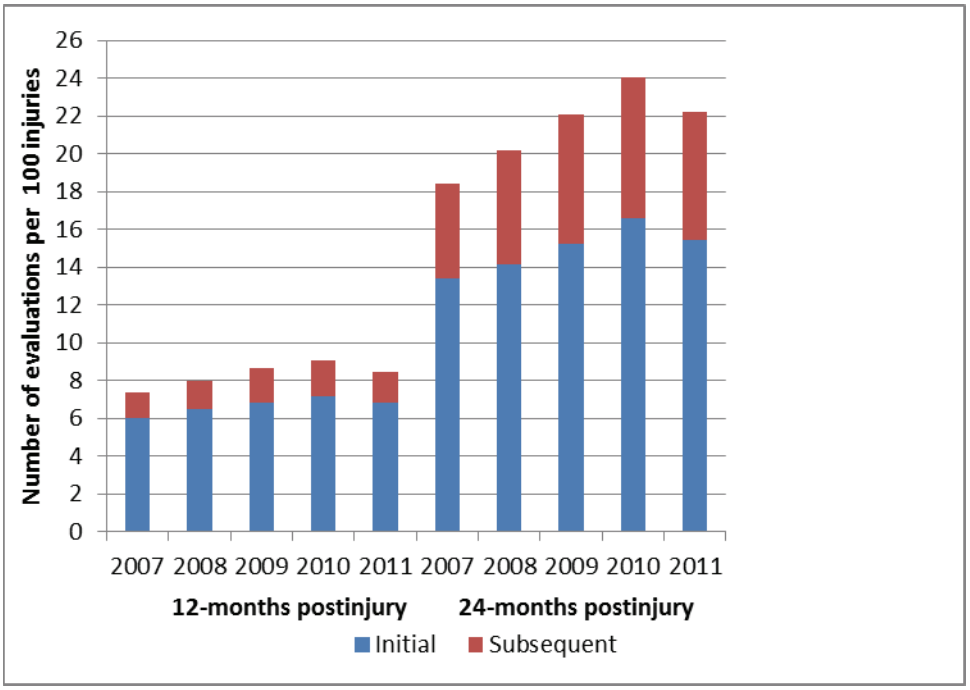


Figure 8.4. Number of Medical-Legal Evaluations by Injury Year at 12 and 24 Months Postinjury



data fell for injuries occurring in 2011. However, the 24-month period for injuries occurring in 2011 includes data for 2013, which may be underreported. More recent data are needed to determine whether this is an actual change in the trend.

Specialty Variation in Medical-Legal Services

We used the specialty reported for each medical-legal service to examine the distribution of medical-legal services by specialty.[3] Approximately 45 percent of the 2007 billed lines for medical-legal services did not identify the specific specialty of the evaluator, reporting the specialty as general practice (provider taxonomy code 208D0000X). In 2012, the percentage reported as generalists dropped to 19 percent. Because QMEs are certified by DWC in a

[3] Instead of classifying providers by specialty, we used the specialty code reported for each medical-legal line. An individual provider may perform medical-legal examinations in more than one specialty. Also, physician management companies contract with physicians in different specialties but bill under a single provider identification number. While the companies typically report the specialty that performed the service, some report the specialty as a multispecialty group practice or legal medicine, or use a general code such as "allopathic and osteopathic physician" or "specialist." These taxonomies are included in the "other specialty" category in the figures that follow, along with unspecified and unknown specialties.

particular specialty or specialties, we assume that this is a WCIS data reporting issue and that most of these evaluations were performed by specialists. We cannot confirm whether this is in fact the case or whether generalists are performing a significant volume of medical-legal evaluations because many bills are submitted under a group NPI or tax ID number without identifying the individual who actually conducted the evaluation. We assigned the evaluations billed as a general practice specialty and by specialists in family medicine to a combined category reported in Table 8.6. Because the percentage of evaluations in this category declined between 2007 and 2012, the observed increases in the evaluations performed by individual specialties over this period could be attributed to better reporting rather than an actual change in the distribution of medical-legal evaluations across specialties. Among the specialty-specific billings, orthopedic surgeons had the highest share of 2012 medical-legal evaluations (28.6 percent) and AME evaluations (32.7 percent). Despite performing a disproportionately high share of AME evaluations, their share of payments is lower (24.0 percent) than their share of evaluations. In contrast, psychiatrists and psychologists have a higher share of medical-legal payments than evaluations. The share of AME evaluations and payments is proportionate to the share of medical-legal evaluations performed by neurologists, and there was little change in these measures for neurology between 2007 and 2012.

Table 8.6. Share of Total Medical-Legal Evaluations, AME Evaluations, and Medical-Legal Spending by Specialty in 2007 and 2012 (percentage)

	2007			2012		
Specialty	**Share of Evaluations**	**Share of AME Evaluations**	**Share of Payments**	**Share of Evaluations**	**Share of AME Evaluations**	**Share of Payments**
Family medicine; general practice	45.9	37.2	44.7	27.1	22.8	27.3
Orthopedic surgery	21.1	28.2	19.5	28.6	32.7	24.0
Occupational medicine	3.8	3.8	4.0	3.4	0.5	3.5
Psychiatry	3.3	2.8	5.4	4.8	5.6	9.0
Internal medicine	2.4	2.2	2.9	4.5	5.7	4.8
Psychology	2.3	1.5	3.7	3.9	3.4	7.1
Chiropractic provider	2.3	0.5	2.0	3.2	0.8	2.7
Neurology	1.7	2.1	1.9	2.4	2.8	2.6
Other surgery	1.6	1.9	1.5	1.6	1.3	1.4
All other specialties and unspecified[a]	15.6	19.8	14.4	20.5	24.4	17.6

[a] Includes both other specified and unspecified, unknown, and out-of-state.

Psychiatry and psychology evaluations had on average the highest number of units billed per service in both 2007 and 2012 (Figure 8.5). These specialty exams also had among the highest increase in the average number of units billed, exceeded only by physicians in family medicine and general practice (74 percent increase) and chiropractors (72 percent increase). Orthopedic surgeons and other surgeons bill on average fewer units per medical-legal service, which accounts for their relatively low average payment per medical-legal evaluation (Figure 8.6). Consistent with billing more units per medical-legal service, psychiatrists and psychologists had the highest average payment per medical-legal service in 2012, $2,840 and $2,750, respectively, compared with $1,250 for orthopedic surgeons.

Regional Variation in Medical-Legal Services

Each year, injured workers in the Los Angeles region were more likely to have at least one medical-legal service than those in other regions, and injured workers residing in the San Diego region were less likely (Figure 8.7). For example, 20.2 percent of injured workers living in

Figure 8.5. Average Units per Medical-Legal Service by Specialty, 2007 and 2012

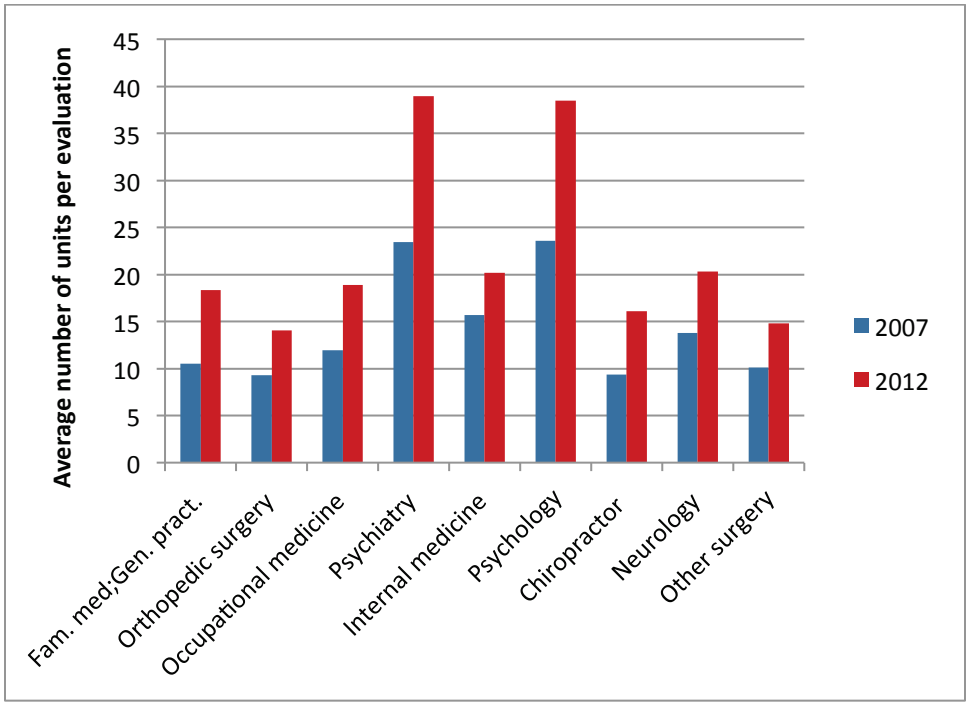


Figure 8.6. Average Payment per Medical-Legal Service by Specialty, 2007 and 2012

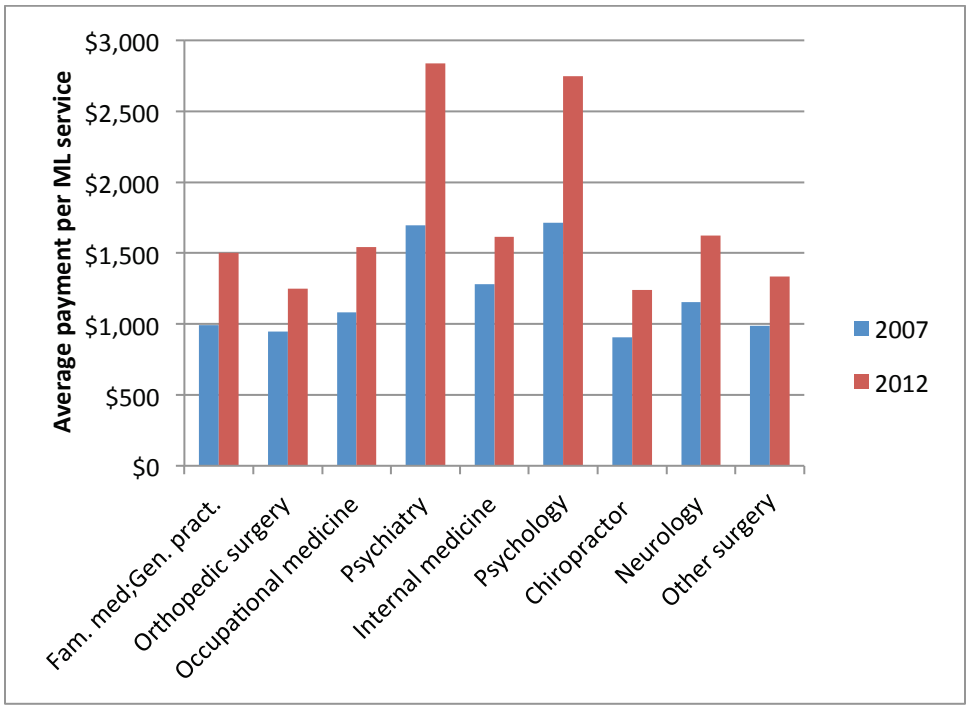
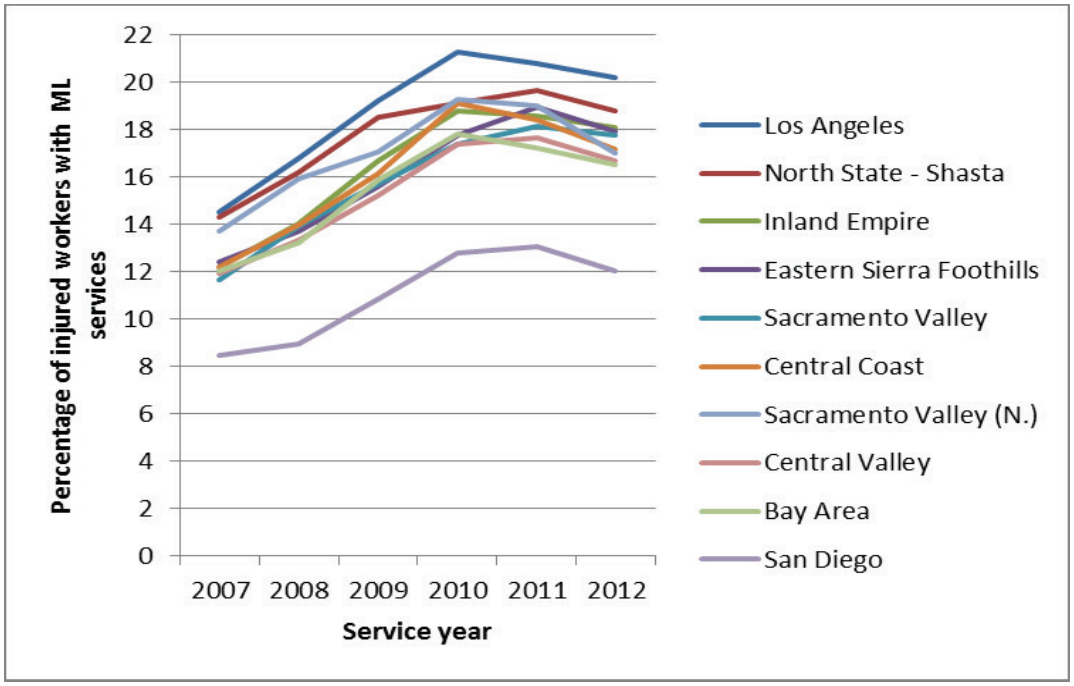


Figure 8.7. Proportion of WCIS Injured Workers with Medical-Legal Services by Region and Service Year



Los Angeles in 2012 had at least one medical-legal service compared with 12.0 percent in San Diego. The percentage of injured workers living in other regions who had medical-legal services ranged from 16.5 percent to 18.7 percent in 2012. In each region there were notable increases in the percentage of injured workers from 2007 to 2010 that peaked in either 2010 or 2011 before decreasing slightly in 2012.

Figure 8.8 shows the distribution of medical-legal evaluations and payments across regions in 2012. Los Angeles accounts for 33 percent of medical-legal evaluations but 39 percent of the payments. In contrast, the Bay Area has a higher share of evaluations (23 percent) than payments (21 percent). The Central Valley has a markedly higher share of evaluations (11 percent) than payments (8 percent) as do the remaining areas (combined measure for East Sierra Foothills, North State–Shasta, Sacramento Valley, out-of-state, and unknown). The higher share of payments relative to evaluations is likely driven by higher billings in the time-based codes (Figure 8.9). Los Angeles had, on average, 22 units per medical-legal evaluation. The other two regions with a higher percentage of payments than evaluations—Inland Empire and San Diego—also had high average number of units per evaluation, which contributed to above-average payments per medical-legal service (Figure 8.10).

Figure 8.8. Share of 2012 California Medical-Legal Evaluations and Payments by Region

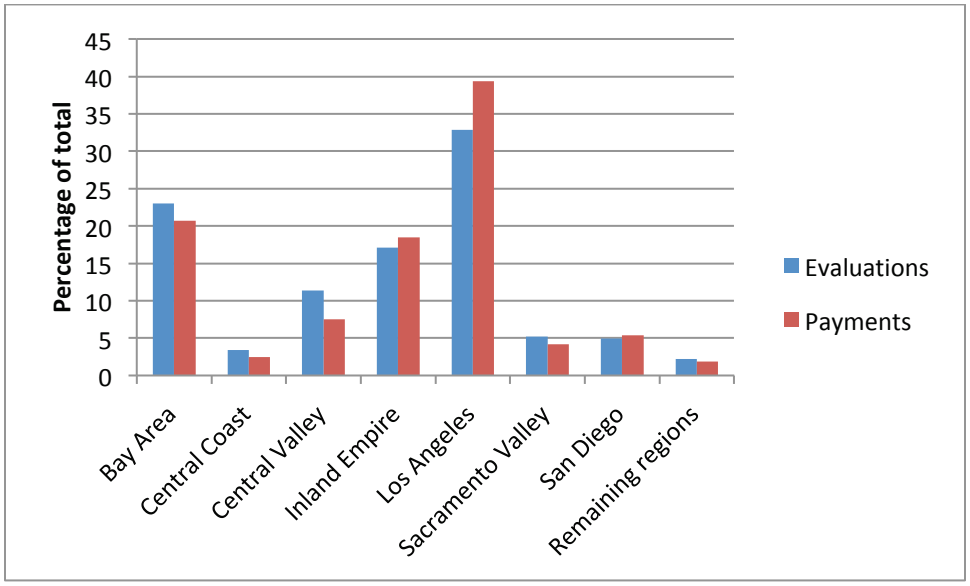


Figure 8.9. Average Units per Evaluation by Region, Service Years 2007 and 2012

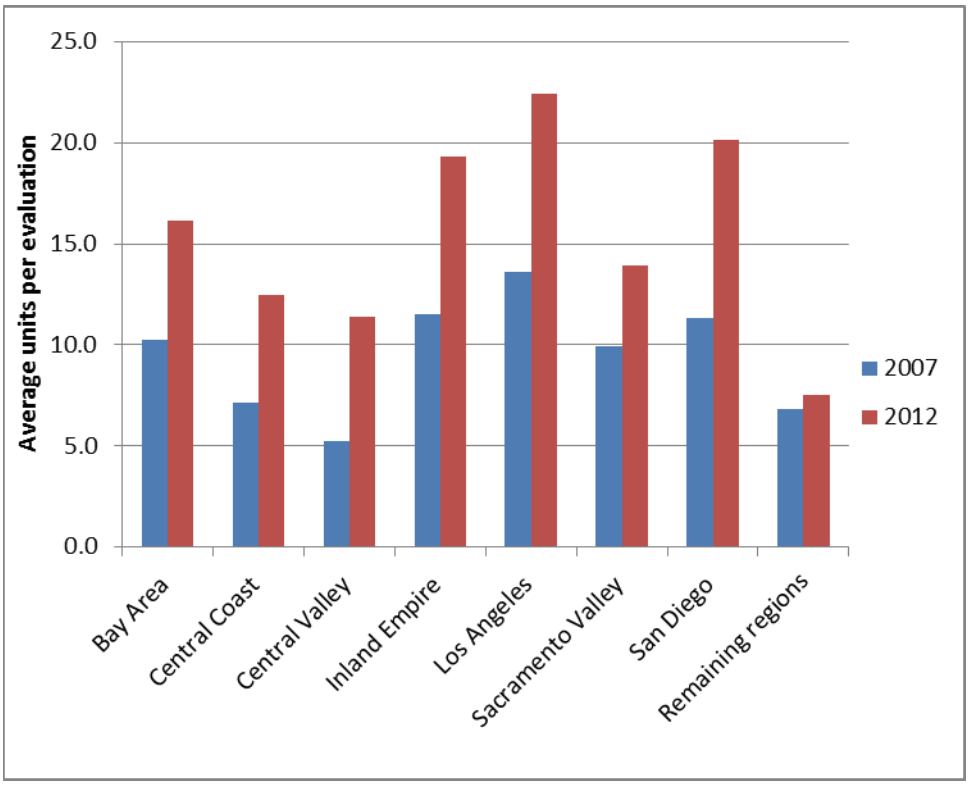
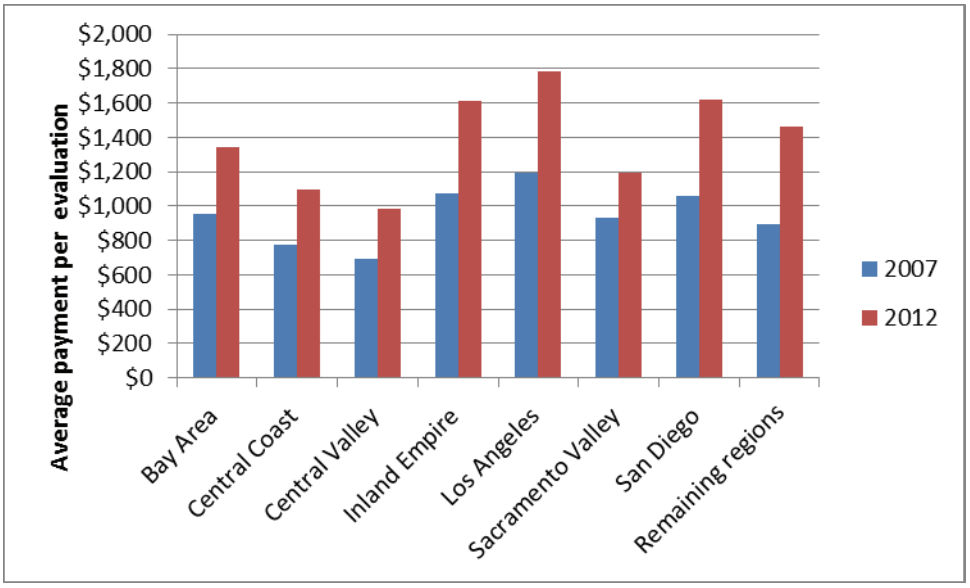


Figure 8.10. Average Payment per Medical-Legal Service by Region, Service Years 2007 and 2012



Other Services

In addition to performing the medical-legal evaluation, providers may order diagnostic tests needed to complete the assessment of work-related issues. We examined the trends in the same provider billing for both a medical-legal examination and other services within 30 days before and/or after the examination. With the exception of E&M services, the other services most often billed by the medical-legal provider were related to diagnostic tests (Table 8.7). For some testing (e.g., radiology, neurology, and neuromuscular procedures), the percentage of medical-legal evaluations for which the medical-legal provider billed for other services declined for some testing but increased for other testing (e.g., central nervous system assessments/tests and cardiovascular monitoring). About 90 percent of the prolonged services billed were for non–face-to-face encounters. Not surprisingly, prolonged services and other E&M services are most often found within the 30-day window when the medical-legal services are provided by a primary treating physician (PTP) (Table 8.8). For example, 43 percent of the medical-legal evaluations billed with a PTP modifier had an E&M service billed within the 30-day window, compared with 5.8 percent and 3.1 percent of those billed with an AME and QME modifier, respectively. These billings are likely for usual treatment being provided around the time of the medical-legal examination. Except for neurology and neuromuscular procedures, other services are more likely to be billed with a medical-legal evaluation by an AME than by a QME. The neurology and neuromuscular procedures had the highest average payments (Table 8.9). Central nervous system tests and procedures were the second-most expensive type of services billed within 30 days by a medical-legal examiner.

Table 8.7. Percentage of Claims with Other Services Billed by Medical-Legal Provider Within 30 Days of Medical-Legal Examination, by Service Year

	Service Year					
Service Category	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Radiology	24.4	24.0	22.9	21.7	21.1	20.6
Prolonged Services	2.8	3.0	2.9	2.8	2.6	2.6
Other E&M Services	10.6	10.3	10.3	10.0	9.7	9.3
Central Nervous System Assessments/Tests	9.3	10.2	10.5	10.3	11.0	11.3
Neurology and Neuromuscular Procedures	8.1	8.1	7.7	7.3	7.3	7.4
Cardiovascular Monitoring	2.8	3.2	3.4	3.5	3.9	3.8
Pulmonary Diagnostic Testing and Therapies	2.2	2.5	2.6	2.6	2.9	2.9
Lab/Pathology	1.8	2.1	2.2	2.3	2.5	2.4

Table 8.8. Percentage of 2012 Claims with Other Services Billed by Medical-Legal Provider Within 30 Days of Medical-Legal Examination by Type of Evaluator

Service Category	All	PTP Modifier[a]	AME Modifier	QME Modifier
Radiology	20.6	11.1	28.1	9.4
Prolonged Services (face-to-face)	0.2	1.1	0.1	0.0
Prolonged Services (not face-to-face)	2.4	12.5	0.4	0.6
Other E&M Services	9.3	43.1	5.8	3.1
Central Nervous System Assessments/Tests	11.3	1.5	11.6	5.7
Neurology and Neuromuscular Procedures	7.4	19.5	6.3	4.9
Cardiovascular Monitoring	3.8	1.0	5.1	1.8
Pulmonary Diagnostic Testing and Therapies	2.9	0.8	3.9	1.6
Lab/Pathology	2.4	2.5	2.8	1.2

NOTE: Based only on medical-legal bills that reported a modifier. About 48 percent of evaluations are billed without a modifier.
[a] Services billed by a PTP are likely for usual treatment being provided around the time of the medical-legal examination.

Table 8.9. Average Payment for Other Services Billed by Medical-Legal Provider Within 30 Days of Medical-Legal Evaluation, by Service Year (in dollars)

	Average Payment by Service Year					
Service Category	2007	2008	2009	2010	2011	2012
Radiology	231	219	210	235	240	242
Prolonged Services	178	181	192	200	172	163
Other E&M Services	224	210	199	201	206	193
Central Nervous System Assessments/Tests	692	623	579	589	583	584
Neurology and Neuromuscular Procedures	650	619	616	668	707	695
Cardiovascular Monitoring	583	514	422	425	404	396
Pulmonary Diagnostic Testing and Therapies	674	522	278	250	250	242
Lab/Pathology	478	199	189	195	186	208

Supply of QME Examiners

In addition to using the WCIS to examine the volume of and payments for medical-legal examinations, we used it to examine the distribution of QMEs by specialty and region. DWC provided us with a listing as of December 31, 2014, of 2,831 certified QMEs who were listed in one or more specialties and up to ten office locations. Placement in a physician specialty pool does not require board certification, but a physician must have completed postgraduate training in the specialty or have qualifications that the MBC or the Osteopathic Board deem equivalent to board certification in the specialty. Comparable requirements apply to nonphysician specialties. Most individuals on the certified QME listing were listed for only one specialty,

19 percent were listed for two specialties, and 5 percent for three specialties. Most multiple listings were for subspecialties within a broader specialty (for example, neurological surgery and spine surgery).

A direct comparison of the specialty distribution of certified QMEs and those performing medical-legal examinations is problematic because of how the specialty is reported in the WCIS for medical-legal evaluations. In addition, AMEs performing medical-legal evaluations do not need to be certified as QMEs, so the listing of certified QMEs understates the number of individuals willing to perform medical-legal evaluations. Keeping these limitations in mind, we compared the specialty distribution of certified QMEs with the specialty distribution for all medical-legal evaluations and the specialty distribution for QME evaluations exclusive of those reported using the generalist MD/DO code. The latter assumes that the actual distribution of the medical-legal evaluations reported as "general practice" is similar to the distribution of the reported specialties. We created unduplicated counts for the following specialty/subspecialty certifications: general internal medicine and internal medicine subspecialties; orthopedic, hand, and spinal surgery; neurological surgery and spine surgery; and other surgery (other than orthopedic, neurological, and hand or spine surgery). If the reported specialties were different (for example, acupuncture and chiropractic), the examiner was counted twice. When we compare the share of QME exams for which a specific specialty was reported with the distribution of certified QMEs, we find that there is a shortage of certified QMEs in occupational medicine and a surplus of chiropractors and psychologists who are certified QMEs (Table 8.10).

Table 8.10. Comparative Distribution of All QME Examinations, Share of Exams with Known Specialty, and Certified QMEs (percentage)

Specialty	Share of 2012 QME Exams	Share of 2012 QME Exams with Specialty Reported	Share of Certified QMEs
Orthopedic surgery	26.3	39.4	41.0
Occupational medicine	5.1	7.6	1.6
Chiropractic provider	4.7	7.0	23.9
Psychiatry	4.3	6.5	7.5
Psychology	4.2	6.3	20.2
Internal medicine	3.8	5.7	4.7
Neurology	2.1	3.2	3.5
Other surgery	1.8	2.6	4.3
Physical medicine and rehabilitation	1.7	2.6	4.1

Limitations

The general limitations of using the WCIS data that were discussed in Chapter Two apply to these analyses. In addition, data reporting issues preclude using the current WCIS data to ascertain the distribution of medical-legal evaluations by specialty and to assess the implications of the growth of medical-legal management companies. With the implementation of a requirement for reporting NPIs at the line-item level, an assessment of these issues should be possible in the future. We developed our analysis plan as part of an overall approach that relies on WCIS data to monitor system performance. An alternative approach to assessing whether the supply of certified QMEs is adequate would have been to compare DWC logs of requests for QME specialty panels with the QME listings. This would provide information on the rates at which panels are requested by specialty relative to the number of certified QMEs. It would not, however, provide information on the number of unique individuals who actually perform evaluations.

Key Findings

Despite the lack of fee schedule changes and a reduction in the number of WC claims, WCIS aggregate spending for medical-legal expenses increased 46 percent. When we decomposed the spending increases relative to 2007, we found that the major cost drivers were an increase in the volume of follow-up evaluations and, most importantly, an increase in the proportion of evaluations that were billed based on 15-minute increments and in the average number of units billed per evaluation. In addition, there is a steady increase in the percentage of claims with medical-legal codes within the first 36 months following dates of injury. The proportion of injured workers receiving medical-legal services in a given service year is considerably higher in Los Angeles than in other regions in the state.

Discussion

The study period (2007–2012) was a period of relative stability in the regulatory policies and processes pertaining to medical-legal services. The American Medical Association (AMA) *Guides to the Evaluation of Permanent Impairment* (5th edition) medical evaluation protocols and rating procedures have been used to determine impairment ratings for compensable claims arising on or after January 1, 2005.[4] There were no changes in the medical-legal fee schedule over the period, so any spending changes are attributable to changes in the number and type of evaluations that were performed, the amount of time required to complete them, and the proportion performed by AMEs.

[4] The AMA *Guide* was also applicable to pre-2005 injuries if there was no comprehensive medical-legal report or no PTP report indicating the existence of a permanent disability.

9. Summary of Overall Findings and Recommendations for Monitoring System Performance

In general, we found that the WCIS can be used both to monitor overall trends in spending and utilization of medical services provided to injured workers and to examine specific issues. The findings discussed in this report highlight the richness of the data and illustrate how they might be used to assess the ongoing performance of the WC medical treatment system. The results also suggest areas that would benefit from further analysis, including

- increases in per-user spending for hospital services, laboratory testing, and drugs
- potentially inappropriate use of imaging services
- gaps between date of injury and date reported to the employer and the date of the first medical service
- initial medical services that do not involve an E&M visit
- adequacy of the certified QME list and implications of the growth of medical-legal management companies.

The results also serve as a baseline for evaluating the impacts of the SB 863 changes and other initiatives, such as the upcoming implementation of a WC drug formulary.

However, there are limitations to using these data, because not all WC claims are reported into the system and among the reported claims, there is further underreporting of medical bills. We addressed the underreporting by examining spending and utilization on a per-claim basis or as a percentage of total spending. Until there is greater compliance with reporting requirements, estimates of total spending and utilization cannot be generated from the WCIS data without accounting for the underreporting by supplementing the WCIS with external data. Because of underreporting on indemnity data, our decomposition of the spending increases was limited by not being able to identify injured workers who received temporary or permanent disability payments.

Other limitations in the WCIS constrained the issues that we were able to examine. The relative newness of the data meant that our trend analyses were restricted to 24 months following date of injury. Trends for additional years following the date of injury will be feasible in the future. Two important data elements that have not been collected in the past—an NPI for the provider furnishing each service and an identifier for each MPN—became mandatory data elements with the implementation of WCIS version 2.0 for medical data effective April 6, 2016. Assuming that the new reporting requirements are enforced, the ability to compare medical services across MPNs and determine which California providers are furnishing services to injured workers will be greatly enhanced.

Recommendations for Monitoring System Performance

As discussed in an earlier study (Wynn, Timbie, and Sorbero, 2011), a performance monitoring system should be designed to provide information that will enable policymakers and other stakeholders to identify areas in which performance is suboptimal. This allows for the prioritization of identified issues and the development of policies and interventions that will facilitate improvements in performance. These same systems can then be used to evaluate the effects of reforms and interventions.

For this report, we focused on a set of measures that can be derived from administrative data and used on an ongoing basis to monitor trends in WC medical care and to identify potential issues that merit further analysis. The timing of this report is such that the trends predate the major reforms enacted in SB 863. Therefore, our results are generally more appropriately utilized as a baseline for evaluation of the SB 863 provisions than as a springboard for identifying potential issues meriting additional policy changes. A discussion of potential policy changes is more appropriately deferred until the SB 863 provisions are evaluated.

Our results confirm the utility of the WCIS data but also highlight data limitations. DWC has incorporated additional data elements into the WCIS medical data reporting requirements that should address some important limitations in using the WCIS to monitor system performance. However, ongoing system monitoring relies on having complete and reliable WCIS data. Heretofore, DWC has focused its efforts on encouraging voluntary compliance rather than enforcement. These efforts have not been sufficient to yield complete reporting, and enforcement actions are indicated to improve compliance. Senate Bill 826 (Leno) added administrative penalties to Labor Code section 138.6 for failing to comply with WCIS data reporting requirements in 2011. Regulations were proposed in 2013 to implement the financial penalties but were not finalized. SB 1160 (Mendoza) amended the penalties in Labor Code section 138.6 that may be assessed against a claims administrator for failure to comply with the WCIS reporting requirements. Now that substantial clarifications and improvements have been made to the reporting requirements and the penalties for nonreporting have been doubled (up to $10,000 per year), consideration should be given to implementing the financial penalties.

We are also concerned that we are not able to separate medical-only claims from indemnity claims. Currently, DWC requires from each claims adjustor location an Annual Report of Inventory, which provides counts of open claims by claim status. Consideration should be given to expanding this report so that it includes a listing of claims by claim status rather than a summary count. This would allow DWC to reconcile the Annual Report with the information reported to the WCIS and target poor data reporters.

Appendix A: Supplemental Analyses for Chapter Three

A. Summary of Data Used to Develop Cost Driver Trends

As discussed in Chapter Three, we drew on a variety of data sources to establish the trends in three cost drivers over 2007–2012. Table A.1 summarizes the data sources that we used to develop our indices that measure the trend for each cost driver. The index measures changes in spending relative to 2007 systemwide spending (CHSWC, 2014).

Table A.1. Summary of Data Sources for Indices Used in the Cost Driver Analyses

Type of Cost Driver	Data Source for Index of Cost Driver Trends Relative to 2007
Changes in Prices Paid for Medical Care	
Inpatient Hospital	RAND calculated index based on the rate of increase in the composite rate for inpatient hospital services
Hospital Outpatient/ASC	RAND calculated index based on the rate of increase in the conversion factor for hospital outpatient/ASC services
Professional Services	Yang and Fomenko (2014)
Drug	RAND calculated index based on the average of annual changes in the producer price index of pharmaceutical and medicine manufacturing and for pharmacies and drug stores
Medical-Legal	No change in fee schedule rates over study period
Composite index for medical service spending	RAND calculated index based on the weighted average of the index values for each service category by service year. The weight is 2007 spending for the service category updated for inflation to the service year.
Payments to individuals	Annual increases in the CPI-All Urban for medical care
Changes in Incidence of New WC Claims	WCIS statistics on the number of new compensable claims each year
Changes in Injury Mix	RAND calculated index based on changes in the number of new WCIS claims by nature of injury and affected body part (see Section C for further explanation)

B. Estimated Impact of Changes in New Claims Using WCIS Counts Compared with Systemwide Estimates Derived from SOII and WCIRB Counts

A key cost driver in our analyses decomposing spending trends is the change in the incidence of new WC claims. As discussed in Chapter Three, we derived the trend in new WC claims relative to 2007 using WCIS claim counts. Because of the importance of this cost driver, we compare the change in number of new claims relative to 2007 using the WCIS, SOII, and WCIRB (Table A.2). We decided that the WCIS had fewer potential shortcomings than either the SOII or the WCIRB claim counts (Table A.1). The WCIRB insured claims is adjusted to a systemwide estimate based on the insured share of claims reported to the WCIS for each injury year.

The WCIS measure has a higher new claims count than estimates based on either the SOII or the WCIRB data, but the estimate in the percentage reduction in new claims relative to 2007 for most injury years is between the higher reductions estimated by the SOII and the lower reductions than calculated using the WCIRB insured counts adjusted to a statewide measure. As a result, our estimate of the residual spending using the WCIS is lower than the result if we were to use the SOII but higher than the estimate resulting from the WCIRB claim counts (Table A.3).

Table A.2. Comparison of WCIS and WCIRB-Based Systemwide Claims Estimates: Number of Claims, Claims Rate, and Change Relative to 2007

	SOII New Claims		WCIS New Claims		WCIRB-Based Systemwide New Claims Estimate	
Injury Year	Number of Claims (000s)	Percentage Change in New Claims Relative to 2007	Number of Claims (000s)	Percentage Change in New Claims Relative to 2007	Number of Claims (000s)	Percentage Change in New Claims Relative to 2007
2007	594.4	—	661.6	—	611.8	—
2008	541.8	–8.8	610.9	–7.7	533.4	–12.8
2009	491.9	–17.2	533.3	–19.4	502.0	–17.9
2010	464.1	–21.9	532.8	–19.5	508.6	–16.9
2011	440.9	–25.8	521.7	–21.2	505.4	–17.4
2012	451.5	–24.0	533.7	–19.3	517.7	–15.4

Table A.3. Comparison of Systemwide Service Year Real Spending for Medical Services Explained by Changes in Claims Rate Holding All Other Factors Constant Using SOII, WCIS, and WCIRB for Injury Years 2008–2012

	2008	2009	2010	2011	2012
Estimate Derived Using SOII Claim Counts					
Systemwide impact on spending for medical services ($mils)	–124.3	–333.3	–540.8	–736.7	–851.6
Adjustment factor applicable to systemwide spending for injuries occurring in 2008 and later	0.912	0.863	0.824	0.791	0.781
Estimate Derived Using WCIS Claim Counts					
Systemwide impact on spending for medical services ($mils)	–108.3	–352.7	–522.1	–654.8	–728.7
Adjustment factor applicable to systemwide spending for injuries occurring in 2008 and later	0.923	0.855	0.830	0.814	0.813
Estimate Derived Using WCIRB-Based Claim Counts					
Systemwide impact on spending for medical services ($mils)	–184.3	–354.3	–406.3	–461.3	–507.3
Adjustment factor applicable to systemwide spending for injuries occurring in 2008 and later	0.8694	0.8550	0.8675	0.8691	0.8698

C. Detailed Explanation of Injury Mix Adjustment

Chapter Three provides an overview of the approach used to determine the injury mix adjustment for changes in type of injury by body part. We divided the claims in each injury year into 40 groupings by type of injury by body part. For each grouping of 2007 claims, we computed average real medical spending at 12-month intervals starting at 12 months from date of injury through 72 months from date of injury. We then calculated a relative weight for each of the 40 groupings at each maturity level by dividing the average real spending per 2007 injury (including closed claims) for the grouping by the average spending across all groupings. We used the relative weights for each grouping at different maturity levels to adjust future year spending for differences in injury mix.

Table A.4 illustrates how the calculations were done for the five groupings involving strains and tears. Strains and tears are the most common types of injuries, accounting for nearly 30 percent of 2007 injuries. We classified 2007 injuries with strains and tears into five body part groupings: lower extremity (LE), upper extremity (UE), trunk, other, and multiple. While the calculations were done separately for all 40 groupings, we show in Table A.4 the average weight for all other injury groupings combined, and all 2007 injuries. Using 2007 injuries involving LE strains and tears as an example, total spending was $49.1 million during the first 12 months following injury and $17.4 million in months 13–24 (Section A). The average spending per claim was $2,414 compared with $2,043 for all injuries occurring in 2007 (Section B). Dividing the average expenditure for injuries involving LE strains and tears ($2,414) by the average across all

injuries ($2,043) produces a relative weight of 1.18 (Section C). In other words, medical expenditures for injuries involving LE strains and tears were 18 percent more expensive during the first 12 months than the average expenditures for all injuries.

Table A.4. 2007 Injury Year Total Real Spending, Average Real Spending per Claim, and Relative Weight by Injury Year: Strains and Tears, All Other Claims, and All 2007 Claims

		Maturity Level					
	Injury Year Volume	Months 0–12	Months 13–24	Months 25–36	Months 37–48	Months 49–60	Months 61–72
A. Total Spending ($mils)							
StrainTear-Lower Extremity	20,350	49.1	17.4	11.3	8.1	6.5	5.7
StrainTear-Upper Extremity	41,334	100.8	38.0	23.9	17.	13.3	9.9
StrainTear-Trunk	67,170	136.3	67.9	46.6	36.4	30.6	21.3
StrainTear-Multiple	10,281	27.1	13.1	9.7	8.1	6.6	5.6
StrainTear-Other	1,175	1.9	0.7	0.5	0.3	0.4	0.2
All Other Claims	336,750	659.3	228.5	157.6	120.1	95.8	81.2
All 2007 Claims	477,060	974.6	365.6	249.6	190.1	153.1	123.9
B. Average Injury Year Claim Spending ($)							
StrainTear-Lower Extremity	20,350	2,414	853	556	400	317	282
StrainTear-Upper Extremity	41,334	2,438	919	578	412	321	239
StrainTear-Trunk	67,170	2,030	1,012	694	542	455	317
StrainTear-Multiple	10,281	2,636	1,277	942	786	645	545
StrainTear-Other	1,175	1,635	577	413	262	322	206
All Other Claims	336,750	1,958	678	468	357	284	241
All 2007 Claims	477,060	2,043	766	523	398	321	260
C. Relative Weight							
StrainTear-Lower Extremity	20,350	1.18	0.42	0.27	0.20	0.16	0.14
StrainTear-Upper Extremity	41,334	1.19	0.45	0.28	0.20	0.16	0.12
StrainTear-Trunk	67,170	0.99	0.50	0.34	0.27	0.22	0.15
StrainTear-Multiple	10,281	1.29	0.62	0.46	0.38	0.32	0.27
StrainTear-Other	1,175	0.80	0.28	0.20	0.13	0.16	0.10
All Other Claims	336,750	0.96	0.33	0.23	0.17	0.14	0.12
All 2007 Claims	477,060	1.00	0.38	0.26	0.20	0.16	0.13

SOURCE: DWC (2016b).

For each subsequent injury year and maturity level, we then determined an average relative weight based on the 2007 relative weights calculated for each injury/body part weighted by the number of injuries in each of the groupings in the subsequent year. At each maturity level, we determined the ratio of the average relative weight subsequent year claims to the average relative weight for the 2007 claims. A ratio of 1.05 indicates the change in injury mix is estimated to have increased spending for the subsequent year claims 5 percent relative to spending on 2007

injuries at the same maturity level. Similarly, a ratio of 0.95 indicates that the change in injury mix reduced spending for the subsequent year claims 5 percent relative to 2007 injuries. We estimated the systemwide impact by applying the percentage difference in spending to the 2007 estimated real spending at each maturity level. Finally, we converted our estimates of injury year spending impacts by maturity level to service year spending impacts.[1]

When the costs for each category of injury are held constant at 2007 spending levels, the injury mix in subsequent years is slightly more costly than the 2007 injuries at various maturity levels. The top rows in Table A.5 show for injury year 2007 the average cost per claim at various maturity levels in nominal dollars. The average cost per claim at 12 months maturity is $2,043. This includes both medical-only claims and indemnity claims. Incremental spending per 2007 injury claim (including those that have closed) between 13 and 24 months after date of injury is another $766.[2] The average relative value is the average spending for that maturity level relative to the average spending per 2007 claim at the 12-month maturity level (for example, injury year 2007 average spending during months 13–24 was 0.375, or 37.5 percent of average spending during months 1–12).

The remaining rows in Table A.5 show the adjustment factors for subsequent years that account for changes in injury mix. The adjustment factors at 12 months' maturity increase from 1.003 in 2008 to 1.010 in 2011 and 2012, indicating that changes in injury mix explain less than a 1 percent impact on spending levels 12 months from injury. The pattern of higher-cost case mix in the later injury years relative to earlier injury years is consistent across maturity levels. For example, the adjustment factor for incremental spending between 12 and 24 months is 1.0047 for injury year 2008 and increases to 1.0202 for injury year 2011. The effect on the average spending per claim is determined by applying the adjustment factors to the 2007 real spending per claim at each maturity level. The spending shown in Table A.5 is per-claim spending at 12-month intervals following date of injury. We used the injury year adjustment factors shown in Table A.5 to develop the adjustment factors reported in Table 3.8 that reflect the effect of the differences in injury mix on service year spending holding other factors constant. Our method for doing so is explained in Section D.

[1] To make this adjustment, we assume that services are spread evenly throughout the year. The midpoint of the injury year is July 1. We assume that 50 percent of the expenses for the first 12 months following an injury occur in the calendar year in which the injury occurs and the remaining 50 percent of the 12-month expenses following the date of injury occur in the first six months of the succeeding calendar year. Fifty percent of the expenses for months 13–24 following the date of injury also occur in the succeeding calendar year.

[2] Note that the denominator is held constant across the years so that injury mix in subsequent years is unaffected by changes in the rates at which claims for different injuries are closed.

Table A.5. Real Spending at Different Claim Maturity Levels Relative to Spending for 2007 Injuries

	Incremental Spending by Claim Maturity Levels				
	First 12 Months	13–24 Months	25–36 Months	37–48 Months	49–60 Months
Injury Year 2007					
Average spending per claim ($)	2,043	766	523	398	320
Average relative weight	1.0000	0.375	0.256	0.195	0.157
Injury Year Adjustment Factors					
2008	1.003	1.005	1.005	1.005	1.009
2009	1.006	1.015	1.015	1.013	
2010	1.005	1.018	1.016		
2011	1.010	1.020			
2012	1.010				
Impact on Injury Year per-Claim Spending (2007 $)					
2008	6.15	3.63	2.41	2.16	2.75
2009	11.98	11.31	7.60	5.31	
2010	10.78	13.46	8.18		
2011	19.44	15.73			
2012	19.78				

D. Application of Cost Driver Indices

Spending for medical services in a given service year is composed of spending for new claims reported in that year and spending for prior injuries at different maturity levels. The index for medical inflation is applicable to all injury year spending within a given service year. In other words, all 2008 spending regardless of service year is affected by the rate of increase in medical prices between 2007 and 2008. In contrast, the index values for changes in the incidence of new claims and injury mix affect only service year spending for injury years 2008 and later and do not affect spending for earlier injury years.

To apply the adjustment factors for changes in the incidence of new claims and injury mix, we first stratified service year medical spending by injury year (Table A.6). Each cell in the table shows actual spending in that service year for WC claims by injury year. These are nominal dollars before adjustment for inflation. We use service year spending for 2007 injuries (shown in italics) to determine the adjustment factors that account for changes in cost drivers for injury years 2008–2012. Generally, we measure each cost driver for an injury year (change in incidence of new claims and injury mix) as a percentage change from injuries occurring in 2007 and apply the result as a constant to 2007 spending levels to estimate spending for that injury year in each service year. For example, the number of new WC claims using WCIS counts declined 19.4 percent in 2009 relative to 2007 (Table A.2). All else being equal, we would expect spending for 2009 injury year claims to be 19.4 percent lower in each service year relative to

Table A.6. WCIS Service Year Nominal Spending by Injury Year (in dollars)

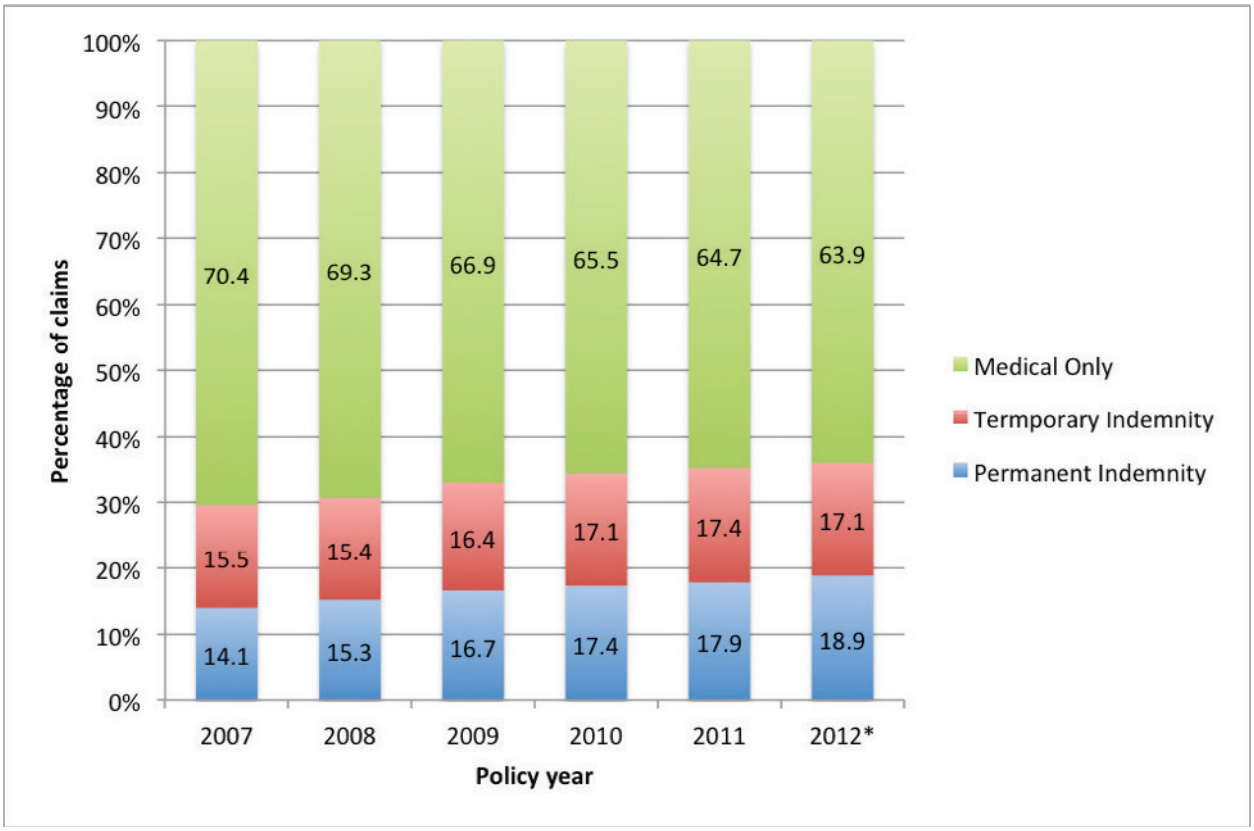
	Service Year					
Injury Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
pre-2007	1486.85	1069.94	861.93	768.22	730.32	634.67
2007	*723.39*	*533.74*	*335.97*	*248.65*	*204.69*	*165.93*
2008		700.91	537.00	361.21	293.12	217.09
2009			644.89	531.14	398.56	306.75
2010				547.01	499.31	381.75
2011					490.41	479.68
2012						538.81
Total	2,210.24	3,374.54	3,241.73	3,224.44	3,346.75	3,359.35

spending observed for 2007 claims of the same vintage. Using 2007 spending as the baseline, we estimated spending for injury year 2009 claims would be \$583.05 (\$723.39 × 0.806) in 2009 (Year 1) and \$430.19 (\$533.74 × 0.806) in 2010 (Year 2).

E. Types of Claim Analyses Using WCIRB Reports

There are three basic types of WC claims: medical-only claims that do not involve any indemnity payments, claims that involve temporary indemnity payments because of days lost from work, and claims that involve permanent indemnity payments (for partial or full permanent disability or death). A limitation of our decomposition analysis is that incomplete WCIS reporting precluded our examining the extent to which changes in the distribution of claims across these three types of claims account for changes in spending levels. To explore the impact these changes might have, we use WCIRB data on types of claims by injury year (Figure A.1). The WCIRB data indicate that there was an increase in both permanent indemnity claims and temporary indemnity claims and a reduction in the percentage of medical-only claims. This may be an important factor in explaining some of the residual spending increase. The ultimate (or total) medical losses over the life of a claim are much higher for permanent indemnity claims and temporary disability claims than for medical-only claims. The latter may be closed with minimal medical treatment, whereas the permanent disability claims may require substantial and continuing medical care. For example, average ultimate medical spending for indemnity claims in policy year 2007 was \$39,122 compared with \$976 for medical-only claims (Table A.7). Average medical spending for all claims increased from \$12,250 in policy year 2007 to \$17,382 in policy year 2012, or 42 percent. When we hold the claims mix type constant to policy year 2007 claims type, average spending per claim in policy year 2012 is 18 percent higher than policy year 2007 spending (Figure A.2).

Figure A.1. Ultimate Distribution of All Claims Reported to WCIRB, Injury Years 2007–2012



SOURCE: WCIRB, January 1, 2015 Pure Premium Rate Filing, Part A, Section B, Appendix A, Exhibit 7.II, http://www.wcirb.com/sites/default/files/documents/20150101_ppr_filing_parta.pdf.

NOTE: Permanent indemnity includes death, full and partial permanent disability. Injury year 2012 experience is partial in that it reflects only experience from policy year 2011.

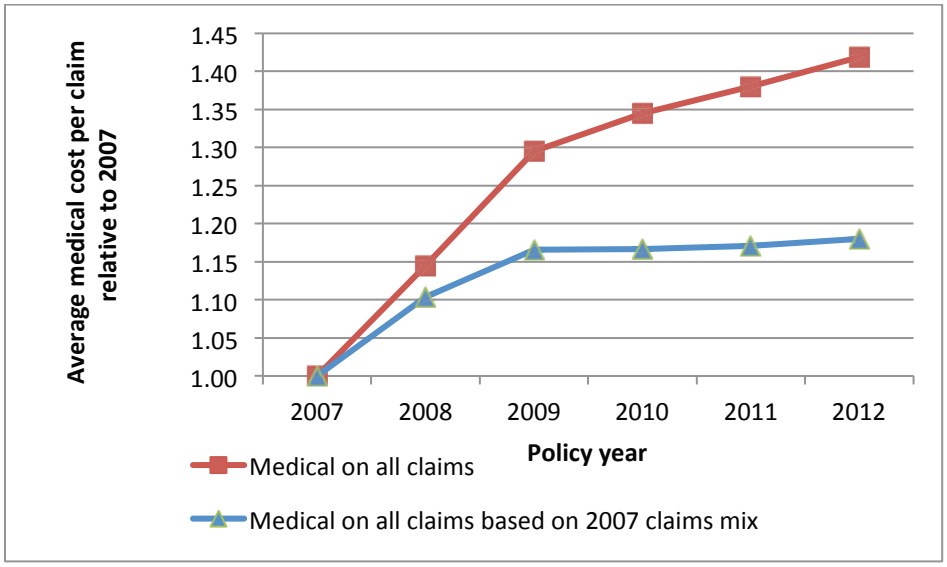
Table A.7. Average Ultimate Medical Losses per WCIRB Claim for Policy Years 2007–2012 by Type of Claim (in dollars)

Injury Year	Permanent Partial Indemnity Claims	Temporary Indemnity Claims	Medical-Only Claims	Medical on Indemnity Claims	Medical on All Claims
2007	69,075	6,713	976	39,122	12,250
2008	74,326	7,319	1,054	43,225	14,020
2009	76,771	8,331	1,152	45,576	15,861
2010	76,763	8,707	1,203	45,481	16,476
2011	74,781	8,358	1,179	45,711	16,904
2012	76,325	8,546	1,184	46,107	17,382

SOURCE: WCIRB, January 1, 2015 Pure Premium Rate Filing, Part A, Section B, Appendix B, Exhibit 5.2.I.

NOTE: Injury year 2012 experience is partial in that it reflects only experience from policy year 2011.

Figure A.2. Comparison of Average Cost per Claim by Policy Year Based on Actual Claim Type Mix and Policy Year 2007 Claim Type Mix



SOURCE: RAND analysis of WCIRB Data in Table A.3.

Appendix B: Monitoring Analyses for Chapters Four Through Six

Type of Injury/Condition Definitions

We established four injury categories: low back pain, neck and upper back, knees, and shoulders for the monitoring analyses in this study. Table B.1 lists the diagnosis codes used to assign an injured worker to each category. We made the assignment based on the diagnoses reported on medical bills within 30 days of the first service date for each claim exclusive of line items reported on laboratory (CPT codes 80047-89398) and radiology (CPT codes 70010-76999) bills since these are often contain "rule out" diagnoses. We counted the number of unique diagnosis codes that were identified as one of the four conditions and any additional diagnosis codes for sprains and strains of joints and adjacent muscles (International Classification of Diseases, Clinical Modification [ICD-9-CM] codes 840-848). We calculated the percentage of total unique diagnosis codes assigned to each of the four conditions and assigned a claim to a condition if at least 66 percent of all unique diagnosis codes were assigned to the given condition.

Table B.1. Diagnosis Codes to Create Injury Condition

Injury Category	Diagnosis Code
Low back pain	344.6, 344.60, 344.61, 353.1, 353.4, 353.8, 353.9, 355.0, 721, 721.42, 721.91, 722, 722.1, 722.10, 722.70, 722.73, 722.8, 722.80, 722.83, 724.0, 724.00, 724.02, 724.09, 724.3, 724.6, 738.4, 952.2, 952.3, 952.4, 952.8, 952.9, 953.1, 953, 953.2, 953.3, 953.5, 953.8, 953.9, 956.0, 349.9, 720.1, 720.2, 720.8, 720.81, 720.89, 720.9, 721.3, 721.7, 721.8, 721.9, 721.90, 722.3, 722.30, 722.32, 722.5, 722.52, 722.6, 722.9, 722.90, 722.93, 724, 724.2, 724.5, 724.7, 724.70, 724.71, 724.79, 724.8,724.9, 737.3, 737.30, 737.39, 737.4, 737.40, 737.41, 737.42, 737.43, 737.8, 737.9, 738.5, 739.3, 739.4, 756.15, 839.2, 839.20, 839.4, 839.40, 839.41, 839.42, 839.69, 839.8, 846, 846.0, 846.1, 846.2, 846.3, 846.8, 846.9,847,847.2,847.3,847.4, 847.9, 848, 848.8, 905, 905.7, 922.3, 922.31, 922.32, 922.8, 922.9, 959.1, 959.19, 959.8, 959.9
Shoulder injuries	Begins with: 726.1 (exclusive of 726.19), 831., 840.; Equal to: 719.01, 719.11, 719.21, 719.31, 719.41, 718.01, 718.11, 718.21, 718.31, 718.71, 718.81, 718.91, 719.46, 953.4, 733.4, 715.11, 715.21, 715.31, 715.91, 727.61
Knee injuries	Begins with: 717., 726.6, 836., 844.; Equal to: 719.86, 822, 822.0, 822.1, 715.00, 715.10, 715.18, 715.20, 891, 718.26, 718.36, 718.46, 718.56, 728.89, 726.60, 822, 822.0, 822.1, 715.00, 715.10, 715.18, 715.20, 715.28, 726.64, 727.66, 715.30, 715.38, 715.80, 715.98, 727.65
Upper back and neck injuries	Begins with: 723., 847.; Equal to: 307.81, 339.11, 339.12, 339.44, 339.89, 784.0, 353.7, 721.0, 721.1, 721.2, 721.41, 722.0, 722.11, 722.31, 722.51, 722.72, 722.82, 722.92, 724.01, 724.1, 739.2, 723.1, 724.4, 338.11, 338.21, 339.20, 339.22

SOURCE: Shraim et al., 2015.

Service Categories and Criteria

Table B.2 documents the procedure codes for professional services (Type B bills) that were assigned to the various service categories in the monitoring tables and the algorithm used to identify facility services reported on Type A bills.

Table B.2. Service Categories and Criteria

Level 1 Category	Level 2 Category	Criteria
Drugs	NA	One of the following: (a) pharmacy bill lines; (b) professional bill lines with HCPCS 99070 and a reported, valid National Drug Code (NDC) number; (c) professional bills with an HCPCS J-code
Evaluation and Management	Case Management Services	CPT range 99358, 99359, 99361-99364, 99366-99369, 99371-99373, 99375-99380
Evaluation and Management	Consultations	CPT range 99241-99277
Evaluation and Management	ED Visits	CPT range 99281-99288
Evaluation and Management	Office Visits	CPT range 99201-99205, 99211-99215, 99354, 99355
Evaluation and Management	Other	All other services in CPT range 99201-99499
Medicine	Manipulative Treatment	CPT range 98925-98943
Medicine	Neurology	CPT range 95805-96020
Medicine	Physical Medicine	CPT range 97010-98778
Medicine	Other	All other services in CPT range 90281-99199 & 99500-99607
Laboratory/Pathology	NA	All services in CPT range 80000-89999
Radiology	Standard Imaging	CPT range 70010-70390, 70550, 71010, 71015, 71020-71023, 71030-71036, 71038-71111, 71120-72052, 72069-72100, 72110-72120, 72170, 72190-72200, 72240, 72255, 72265-72270, 72275-72295, 73000, 73010, 73020, 73030, 73040, 73050-73100, 73110, 73115, 73120, 73130, 73140, 73500, 73510, 73520, 73525, 73540-73560, 73562, 73565, 73570, 73580, 73582, 73590-73600, 73610-73652, 73660, 74000, 74010, 74020, 74022, 74190, 74210-74241, 74245-74485, 74740, 74742, 76000-76062, 76066-76071, 76075-76092, 76095-76102, 76120, 76125, 76140, 76150, 76175, 76176, 76315, 76350, 76496-76499, 77000, 77002-77059, 77071-77084
Radiology	Advanced Imaging	CPT range 70450-70549, 70551-70555, 71250-71275, 71550-71555, 72125-72159, 72191-72198, 73200-73206, 73218-73225, 73700-73706, 72718-73725, 74150-74175, 74181-74185, 76093, 76094, 76355, 76360, 76365, 76370, 76374-76377, 76380-76400
Radiology	Diagnostic Ultrasound	CPT range 76512-76999
Radiology	Other	All other services in CPT range 70000-79999
Surgery	Musculoskeletal	CPT range 20000-29999

Table B.2—Continued

Level 1 Category	Level 2 Category	Criteria
Surgery	Spine and Spinal Cord	CPT range 62268-64999
Surgery	Other	All other services in CPT range 10021-69990
Outpatient Facility Services	Facility payments other than payments for ED visits	All “Type A” facility bill lines with 2-digit bill type code 13 after moving emergency room visits and any professional services to other categories.
Outpatient Facility Services	ED Visits	All “Type A” facility bill lines with 2-digit bill type code 13 and revenue center code values of 0450-0459 or CPT codes 99281-99288. ED visits that are billed on 2-digit bill type code 11 (inpatient) are reported as an inpatient hospital service.
Inpatient Hospital Stays	NA	All “Type A” facility bill lines with 2-digit bill type code 11 after moving any professional services to other categories.

Provider Specialty and Place of Service Crosswalks

Table B.3 documents the provider taxonomy codes that were assigned to the specialty groupings used in the monitoring tables

Table B.3. Specialty Taxonomy Codes to Create Provider Specialty

Provider Specialty	Taxonomy Code
Multispecialty group practice	Begins with: 1932
Single-specialty group practice	Begins with: 1934
Anesthesiology	Begins with: 207L
Orthopedic surgery	Begins with: 207X
Other surgery	Begins with: 2086, 2082, 207V, 207Y, 2088; Equal to: 208C00000X, 207T00000X, 204E00000X, 208G00000X, 204F00000X
Emergency medicine	Begins with: 207P
Family medicine; general practice	Begins with: 207Q 208D
Internal medicine	Begins with: 207R
Ophthalmology	Equal to: 207W00000X
Pathology	Begins with: 207Z
Physical medicine & rehabilitation	Begins with: 2081
Psychiatry	Equal to: 2084A0401X, 2084P0802X, 2084P0800X, 2084F0202X, 2084P0805X, 2084P0804X, 2084S0012X
Neurology	Equal to: 2084P0005X, 2084N0400X, 2084N0008X, 2084P0015X, 2084V0102X, 2084N0600X, 2084D0003X
Radiology	Begins with: 2085 2471
Occup med—MD	Equal to: 2083X0100X
Occup med—occup therapist	Begins with: 225X, 224Z
Other preventative medicine	Begins with: 2083
Legal medicine—MD	Equal to: 209800000X

Table B.3—Continued

Provider Specialty	Taxonomy Code
Legal medicine—non-MD	Equal to: 173000000X
Other MDs	Begins with: 207K, 207S, 207U, 208V, 207N, 2080; Equal to: 208U00000X, 204R00000X, 208M00000X, 202C00000X, 204D00000X, 204C00000X, 2084P2900X, 202K00000X
Dental providers	Begins with: 1223; Equal to: 125K00000X, 126800000X, 124Q00000X, 126900000X, 125J00000X, 122400000X
Pharmacy service providers	Begins with: 1835; Equal to: 183700000X
Registered nurse/physician assistant	Begins with: 163W, 364S, 363L, 363A; Equal to: 164W00000X, 167G00000X, 164X00000X, 163WX0106X, 364SX0106X, 363LX0106X
Physical therapist	Begins with: 2251
Chiropractic providers	Begins with: 111N
Behavioral health & social providers	Begins with: 103K, 103G, 101Y, 106H, 102X, 102L, 103T, 1041
Podiatrist	Begins with: 211D, 213E
Acupuncturist	Equal to: 171100000X
All other practitioners	None of the above

Quality Indicators

The starting points for each of the quality indicator calculations were the claims that were assigned to one of the four injury categories: low back pain, neck and upper back, shoulder, and knees. Each indicator has a defined population that serves as the denominator for the indicator. The denominator may be a subset of the injuries assigned to the injury category. For example, the use of imaging study indicators is limited to uncomplicated diagnoses within the injury category.

Use of Imaging Studies

We used the specifications for the NCQA measure for use of imaging studies for uncomplicated low back pain (NCQA, 2016). This measure has also been adopted by the Centers for Medicare and Medicaid Services (CMS, 2017). Following the American College of Occupational and Environmental Medicine (ACOEM) guidelines, we extended the general construct of the measure to the upper back and shoulder injury categories and dropped the age 18–50 inclusion terms used in the NCQA measure. The shoulder measure includes only CT and MRI procedures, while the measures for the back injury categories also include X-rays. We defined the index date as the earliest service date related to the injury category (i.e., the first service date on which a diagnosis of low back pain was reported for a claim assigned to the low back injury category). Based on the rules for assigning claims to categories, it will be within 30 days of injury.

The specifications for the measure by injury category are summarized in Table B.4. We included in our denominator only claims that (1) had one of the included diagnoses reported on the index date, and (2) did not have one of the excluded diagnoses for the measure within 28 days of the index date. The NCQA measure further restricts the denominator to patients who did not have a related diagnosis in the prior 180 days. We do not apply this restriction, because our data begin with the first service date for a work-related condition and we do not have data pertaining to care preceding the injury. We included the claim in the numerator if it also had one of the imaging codes within 28 days of the index date.

Table B.4. Diagnosis and Procedure Codes Used for Imaging Measure

Injury Category	Included Diagnoses[a]	Excluded Diagnostic Categories[b]	Imaging Codes[a]
Low back pain	721.3, 721.90, 722.10, 722.52, 722.6, 724.02, 724.2, 724.5, 724.6, 724.70, 724.71, 724.79, 738.5, 739.4, 846.0, 846.1, 846.2, 846.3, 846.8, 846.9, 847.2	Neoplasms Recent trauma IV drug abuse Neurological impairment HIV Spinal infection	72010, 72020, 72052, 72100, 72110, 72114, 72120, 72131, 72132, 72133, 72141, 72142, 72146, 72147, 72148, 72149, 72156, 72158, 72200, 72202, 72220
Upper back	721.0, 721.2, 721.90, 722.0, 722.11, 722.4, 722.51, 722.6, 723, 724.01, 724.1, 724.4, 738.2, 738.5, 739.1, 739.2, 847.0, 847.2.	Same as low back pain	72010, 72020, 72040, 72050, 72053, 72069, 72070, 72072, 72074, 72080, 72090, 72125, 72126, 72127, 72128, 72129, 72130, 72141, 72142, 72146, 72147, 72156, 72157
Shoulder	All diagnoses used for injury category	Fractures Complete rupture of rotator cuff (727.61) Aseptic necrosis of head of humerus (733.41)	73200, 73201, 73202, 73221, 73225

[a] The diagnosis codes for uncomplicated low back pain are available on the CMS eCQI website. The diagnosis codes for uncomplicated diagnoses in the other injury categories and the imaging procedure codes are RAND-derived.
[b] See NCQA (2016) for the exclusion code sets.

Lumbar Spine MRI Without Antecedent Care

Using the CMS Physician Quality Reporting System specifications for this measure (CMS, 2012), we identified all bills for claims with low back pain that (1) have one or more MRI procedure codes (CPT 72148, 72149, or 72158) in the 24 months following the date of injury that were billed on the same day as an included diagnosis code in Table B.4, and (2) did not have an excluded diagnosis code at any point during the 24-month period. The denominator is the count of all bills for MRIs identified for this population. The numerator is the count of bills in

the denominator that did not have appropriate antecedent care. Appropriate antecedent care is defined as any of the following:

1. Bills in the 60 days preceding the MRI for injectable analgesic care. These are the following CPT codes: 64470, 64472, 64475, 64476.
2. Bills in the preceding 60 days for physical therapy: CPT 97110, 97112, 97113, 97124, 97140.
3. Bills in the preceding 60 days for chiropractic care (CPT 98940-98943) or osteopathic manipulation (98925-98929).
4. Bills more than 28 days but less than 60 days preceding the MRI with low back pain management and evaluation: CPT 99201-99205, 99211-99215, 99241-99245, 99341-99345, 99347-99350, 99354-99357, 99385-99387, 99395-99397, 99401-99404, 99455-99456, 99499 billed with one of the included diagnosis codes.

Continuous Opioid Use for More Than 14 Days

We imputed the number of days supplied in each physician-dispensed and pharmacy-dispensed prescription for opioids. After accounting for refills, we identified all opioid lines with more than a 14-day supply within 24 months of injury. For each injury category, the denominator is the number of claims assigned to the category. The numerator is the number of claims in the denominator that have any lines for opioid prescriptions with more than a 14-day supply.

Use of TENS and PENS

Following the ACOEM guidelines, we measured the use of TENS and PENS for low back injuries in the acute and subacute stages and the use of TENS for upper back injuries. For each injury category, the denominator is the number of claims assigned to that category. The index date is the first service date for a diagnosis in the injury category. A claim had TENS if its medical bills included one or more lines with CPT 64550 or HCPCS codes E0720, E0730, E0731, and E0745. A claim had PENS if the bills included CPT codes 64553, 64555, 64560, or 64565, or HCPCS codes L8680-L8688. For the low back pain category, the numerator is the number of claims in the denominator that had a procedure code for TENS or PENS within 90 days of the index date. For the upper back pain category, the numerator is the number of claims in the denominator that had a procedure code for TENS within 90 days of the index date.

Use of Electromyogram or Nerve Conduction Studies

Following the ACOEM guidelines, we measured the use of electromyogram and nerve conduction studies (CPT 94860-95875) for shoulder and knee injuries. For each injury category, the denominator is the number of claims assigned to that category. The index date is the first service date for a diagnosis in the injury category. The numerator is the number of claims in the denominator that had an electromyogram/nerve conduction study within 28 days of the index date.

Appendix C: Sensitivity Analyses of Provider Participation Rates for WC Patients

Figure C.1. Physician Participation Rate Based on Any Specialty Reported and NPPES Data

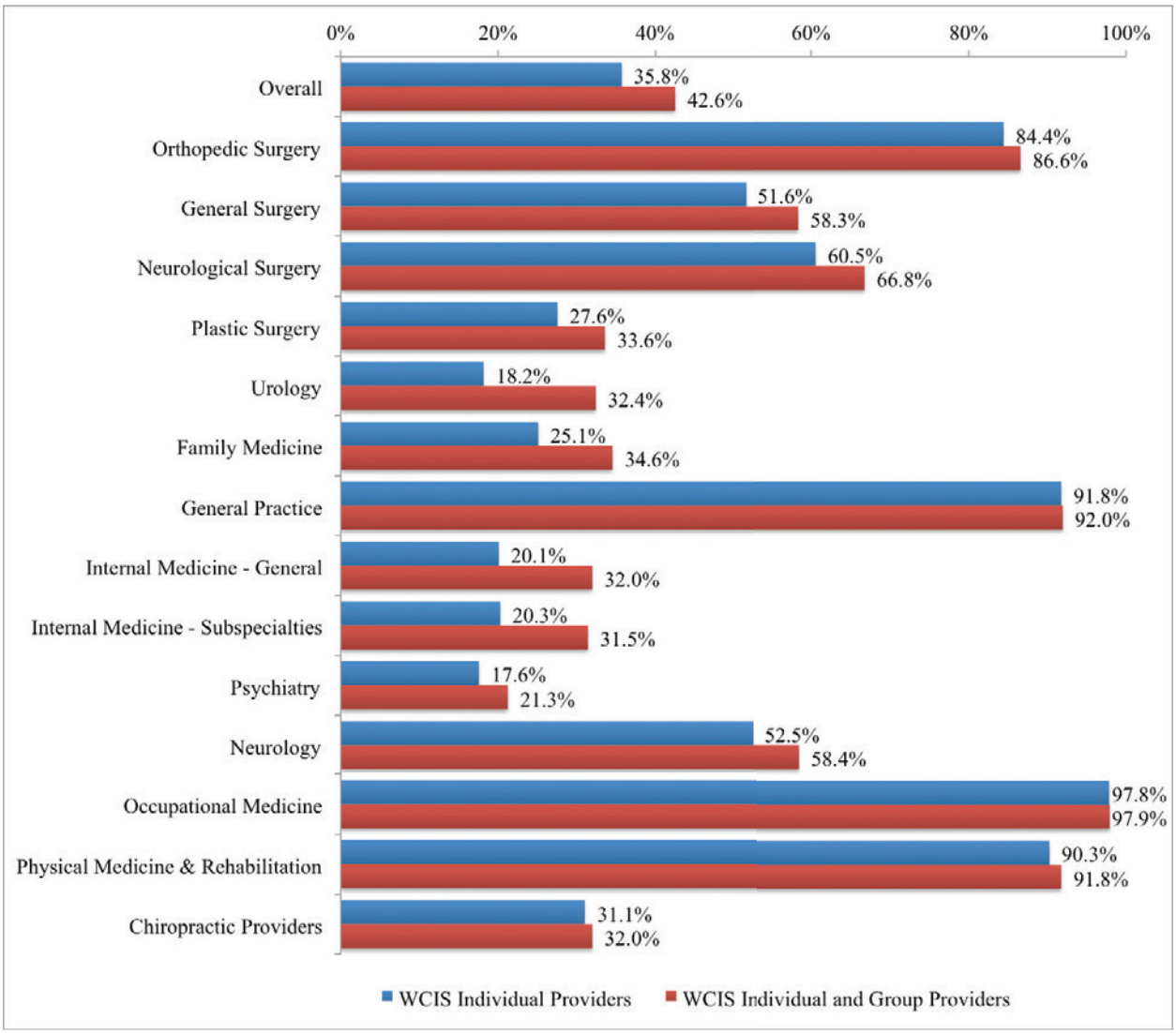


Figure C.2. Physician Participation Rate Based on Primary Specialty Reported, Medicare Data, and SK&A Data

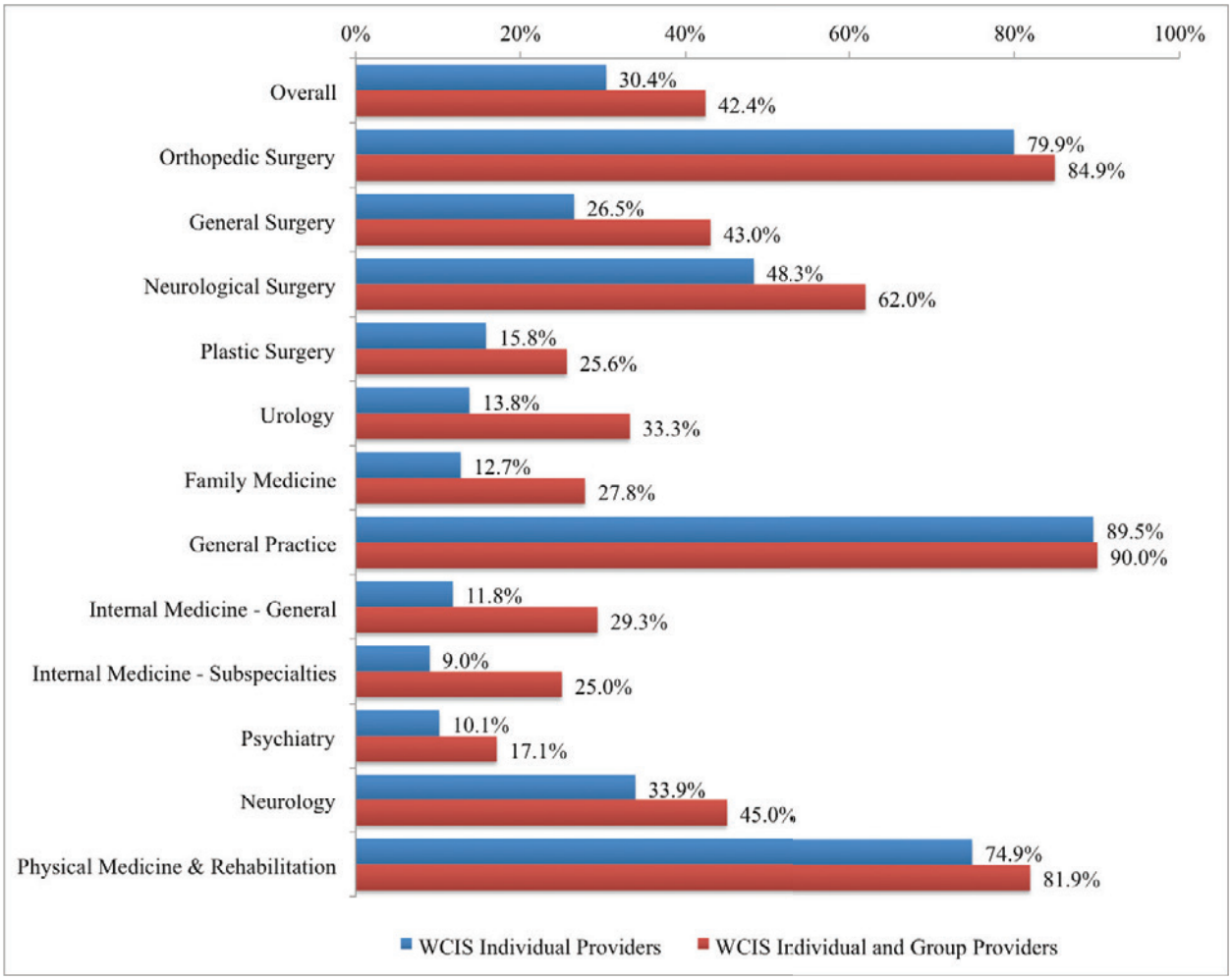


Figure C.3. Physician Participation Rate Based on Any Specialty Reported, Medicare Data, and SK&A Data

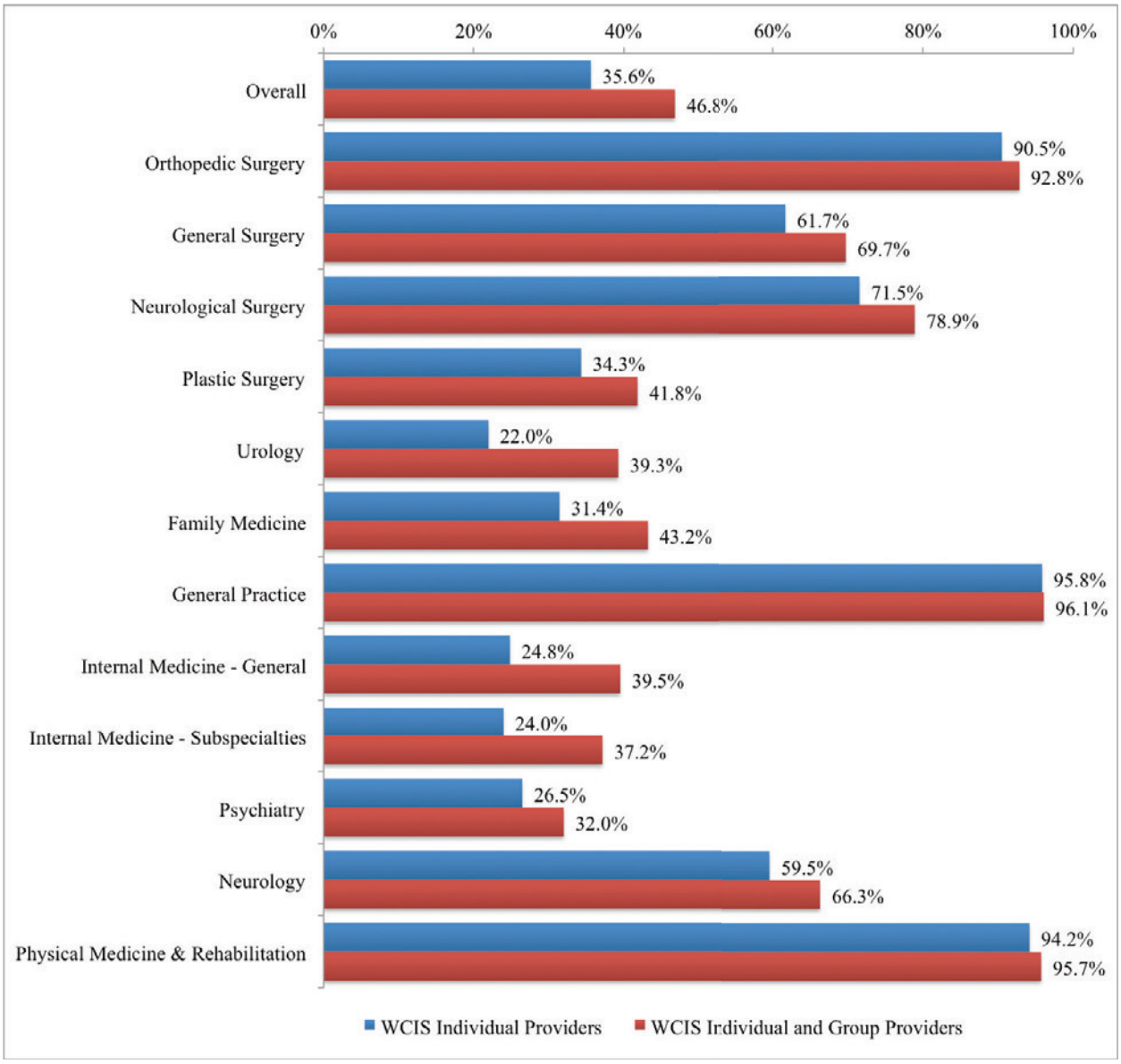


Figure C.4. General Practice Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data

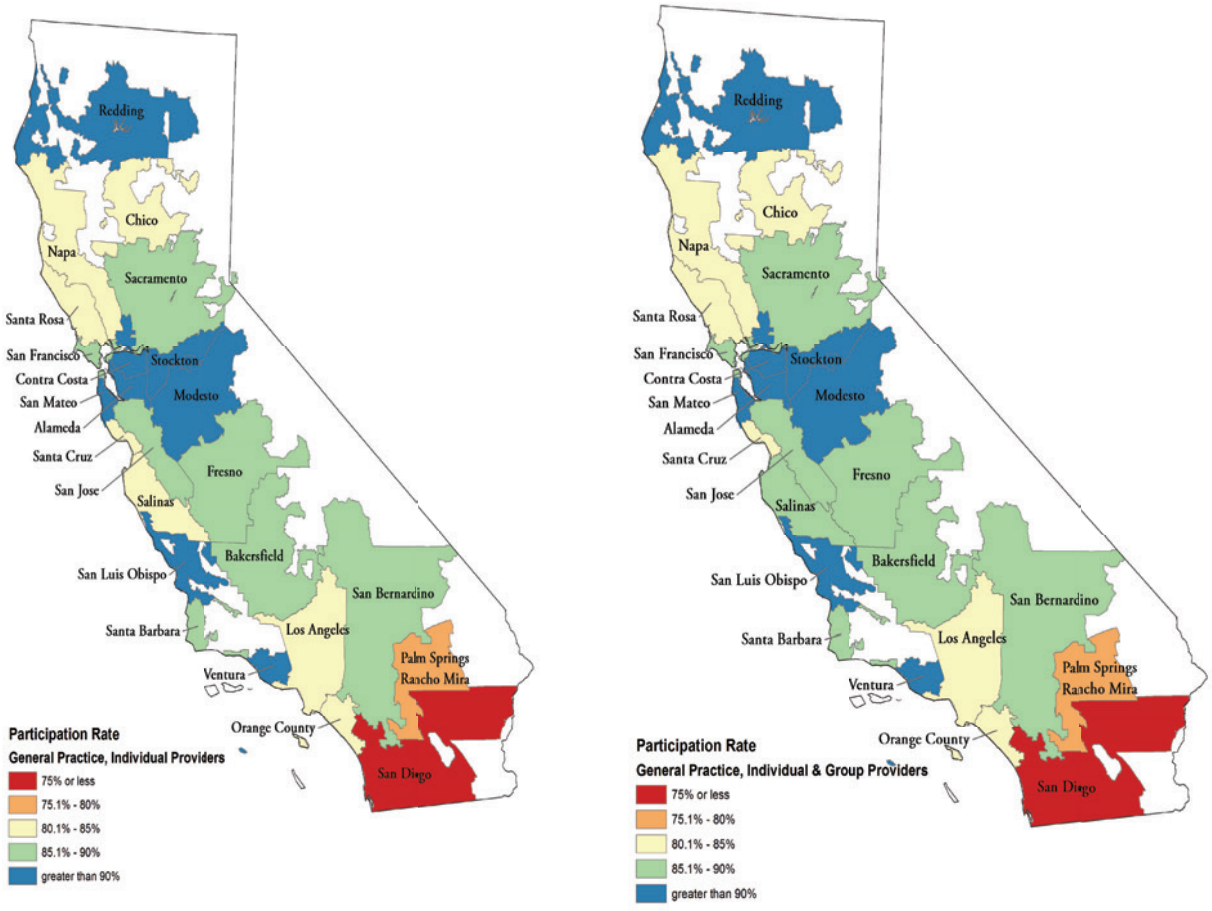


Figure C.5. Family Medicine Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data

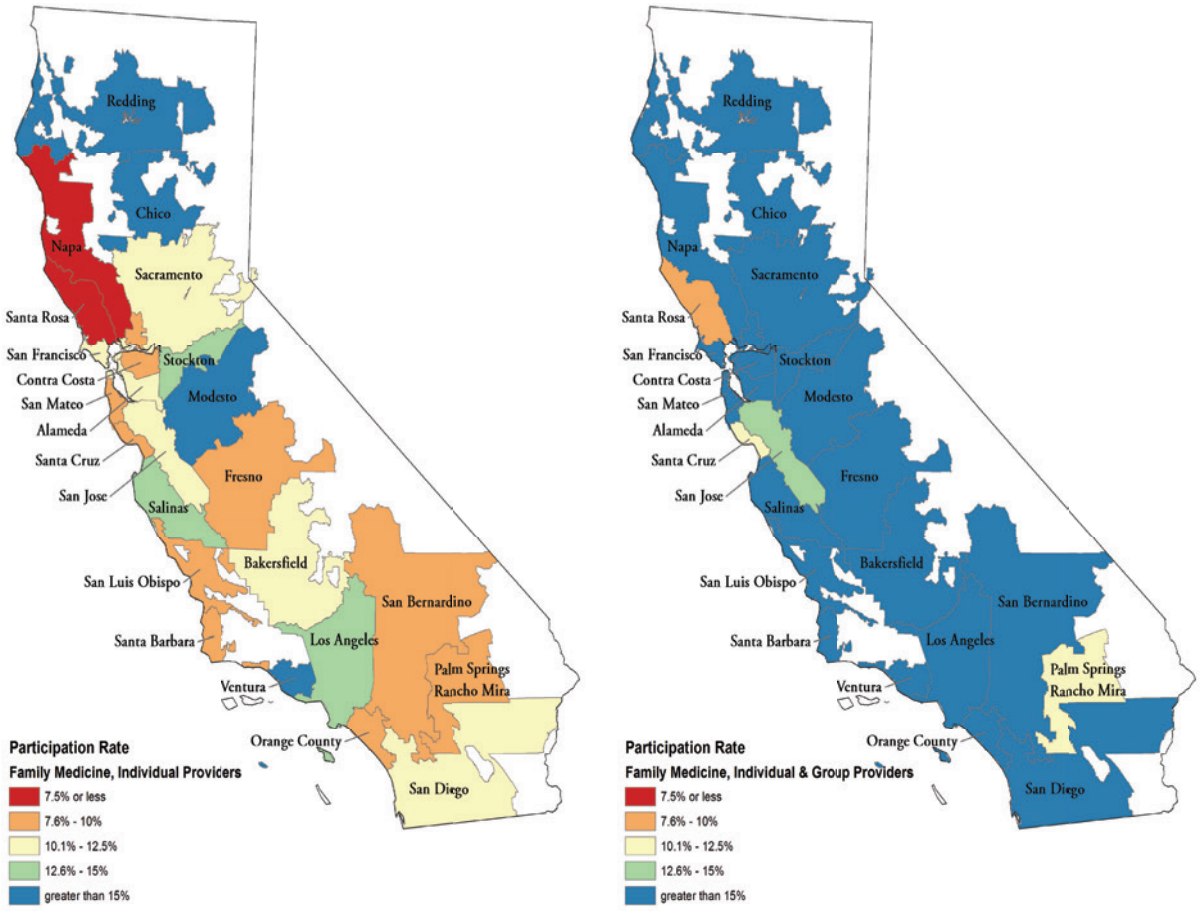


Figure C.6. General Internal Medicine Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data

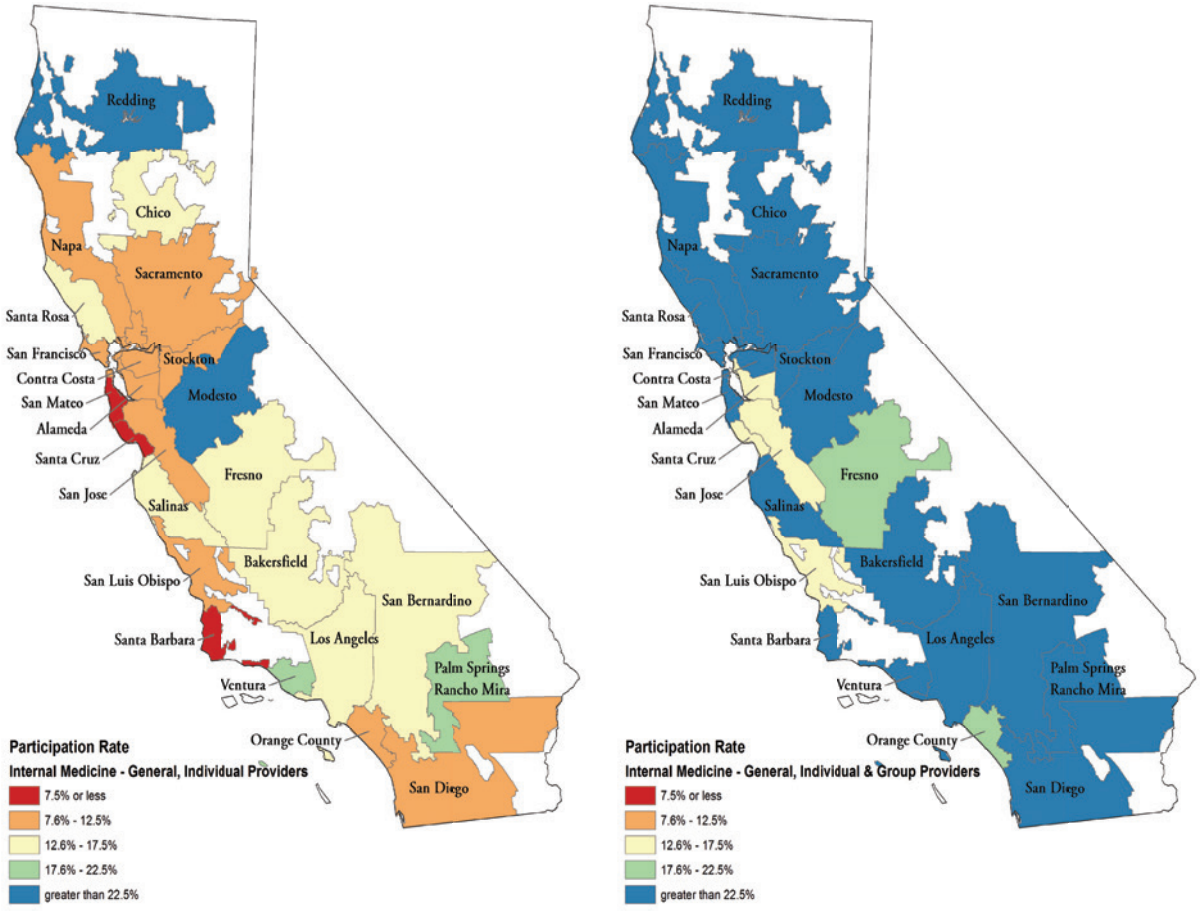


Figure C.7. General Surgery Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data

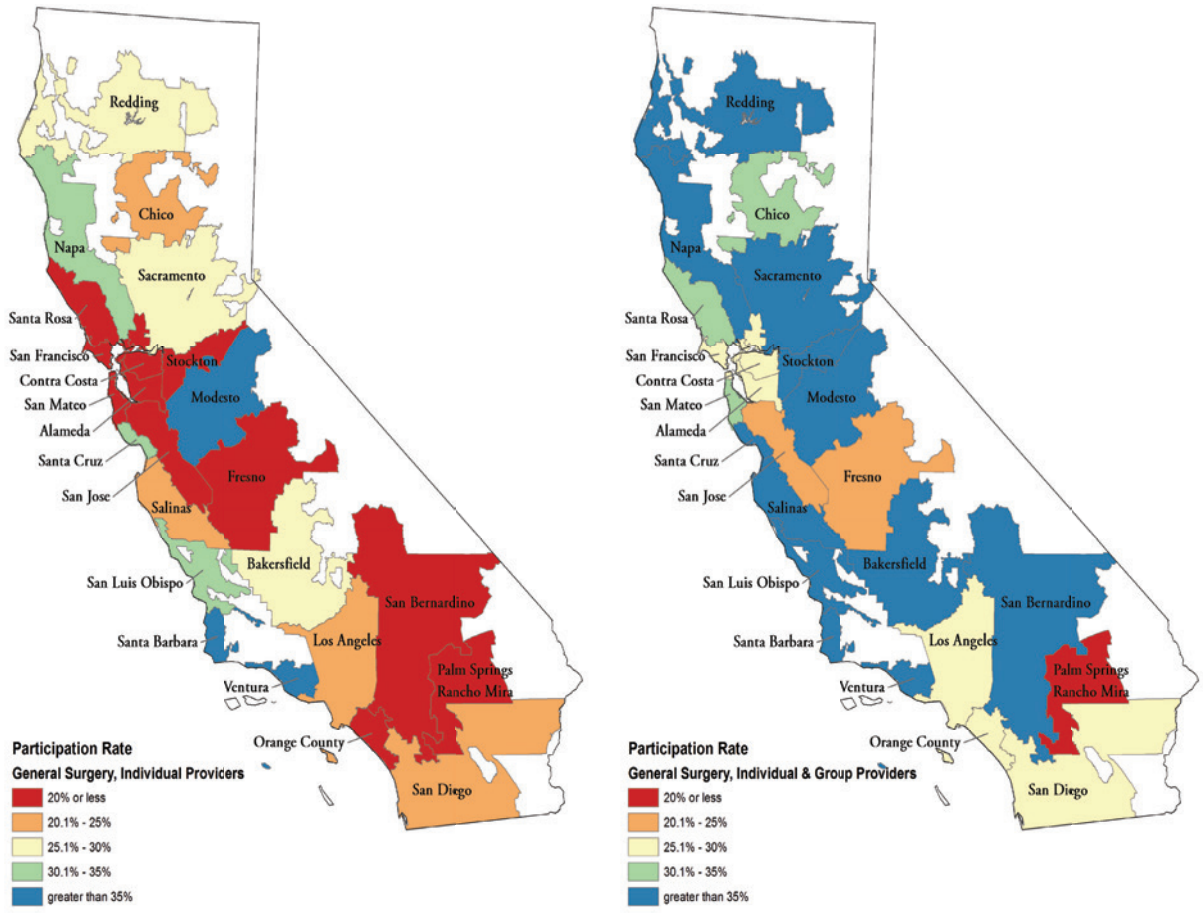


Figure C.8. Psychiatry Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data

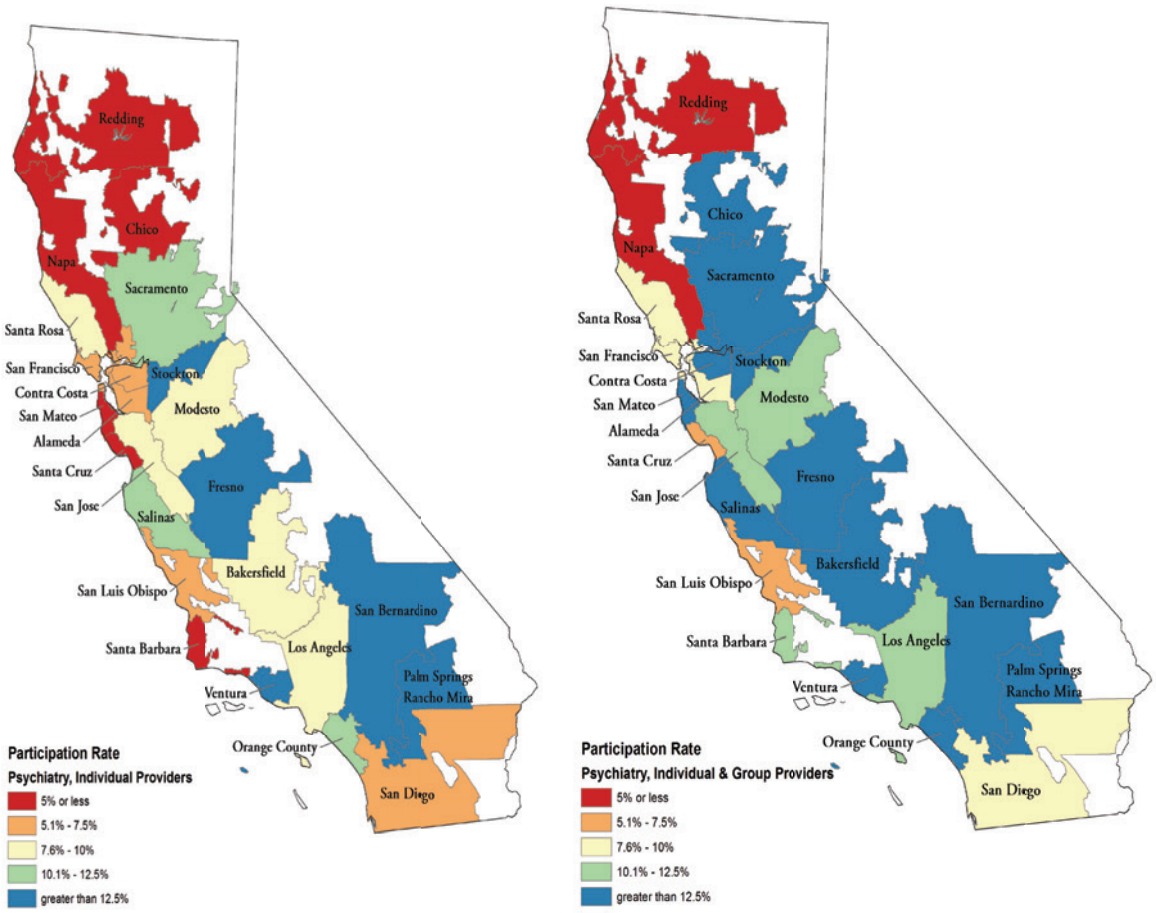
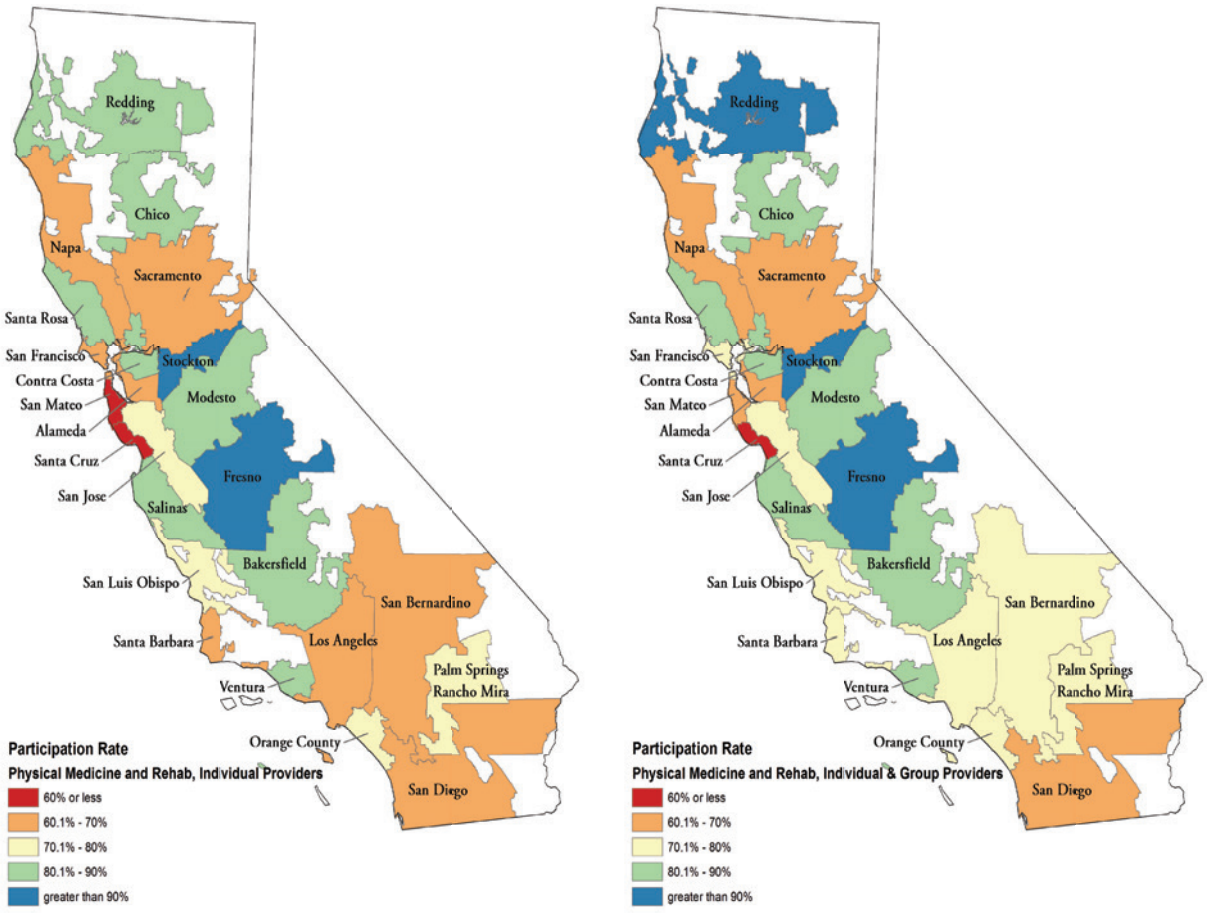


Figure C.9. Physical Medicine and Rehabilitation Participation Rate by HRR, Based on Primary Specialty Reported and NPPES Data



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